EFFECTS OF LUMBAR STABILIZATION EXERCISES, MCKENZIE EXERCISES AND CONVENTIONAL EXERCISES ON PAIN, FUNCTION AND RANGE OF MOTION IN PATIENTS WITH MECHANICAL LOW BACK PAIN

- A COMPARATIVE STUDY

Dissertation submitted to The Tamil Nadu Dr. M.G.R. Medical University towards partial fulfillment of the requirements of **MASTER OF PHYSIOTHERAPY (Advanced PT in Orthopaedics)** degree programme.

KMCH COLLEGE OF PHYSIOTHERAPY

(A unit of Kovai Medical Center Research and Educational Trust)

Post Box No. 3209, Avanashi Road,

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2014 – 2016

CERTIFICATE

This is to certify that research work entitled **"EFFECTS OF LUMBAR STABILIZATION EXERCISES, MCKENZIE EXERCISES, AND CONVENTIONAL EXERCISES ON PAIN, FUNCTION, AND RANGE OF MOTION IN PATIENTS WITH MECHANICAL BACK PAIN"** was carried out by the candidate bearing the **Register No: 271410081,** KMCH College of Physiotherapy towards partial fulfillment of the requirements of the **Master of Physiotherapy (Advanced PT in Orthopaedics)** of The Tamil Nadu Dr. M.G.R. Medical University, Chennai-32.

PROJECT GUIDE

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EXTERNAL EXAMINER

Project Evaluated on:

ACKNOWLEDGEMENT

*First and foremost, I thank **my beloved parents** for their unconditional love, sincere prayers, unstinted support and care without which I would not have accomplished anything.*

*I thank **my God** for always watching upon me with grace to fulfill this endeavor.*

*I thank the KMCH management, especially the chairman, **Dr.Nalla G. Palaniswami MD (AB)**, and the trustee **Dr.Thavamani D Palaniswami MD (AB) F. A. A. P,** for the wide variety of opportunities.*

*I thank **Dr. O T Bhuvaneswaran, PhD**, Chief Executive Officer, for his role in the academic front.*

*I am delighted to express my profound thanks to our beloved principal, **Dr. Edmund Mark D'Couto, M.D, Phys. Med & Rehab,** KMCH College of Physiotherapy, for being a pillar of encouragement and also providing us with all necessary infrastructure and other facilities.*

*I owe my sincere gratitude to my project guide **Mr. David V Samuel, MPT (Ortho),** Associate Professor, KMCH College of Physiotherapy, for her remarkable support, guidance, valuable suggestions, patience and motivation throughout the study. I am obliged to have her share her immense knowledge about the subject.*

*I deeply express my sincere thanks and gratitude to the versatile person, **Mrs. A.P.Kalpana, MPT (Cardio)**, Vice Principal, KMCH College of Physiotherapy, and my class incharge, for her valuable input in my study.*

*I express my gratitude towards **Mr. S. SivaKumar, MPT (Ortho), PGDBS, PGDHM.,** for all the encouragement he has provided to take up this study and complete it with great effort.*

I thank ***Mrs.A.Brammatha, MPT(Neuro), M.H.R.M,*** *Professor, KMCH College of Physiotherapy for her timely and valuable guidance.*

I express my heartiest thanks in this instance to, ***Mrs. R. Uthra Devi, MPT (Neuro),*** *for her valuable suggestions, support and encouragement.*

I am also thankful to ***Mr. Prakash, MPT (Ortho),*** *and all other faculty members for their immense support and motivation throughout the study.*

I extend my gratitude to ***Mr. K Venugopal, MA, MPhil,*** *Professor, Research & Statistics, for guiding me with the necessary tools to analyze my study without which it was impossible to draw the inference.*

I am thankful to Dr. ***S. Sreedharan Namboodhiri*** *for his valuable suggestions and also sharing his vast knowledge and experience for the accomplishment of this study.*

I thank the faculty members for their guidance and willingness to clear all my doubts. Their suggestions have been really helpful.

I thank the librarians of this institute, ***Mr. P Dhamodaran*** *and his fellow members for their cooperation. I sincerely acknowledge my best friends, batch mates, my seniors, and all my well wishers who were always there to guide and render their support to me throughout my project.*

I am truly grateful to all my friends and batchmates for their selfless help and assistance in this study.

Last but not least I also extend my thanks to all the participants and their family members for their willingness and co-operation in the study.

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ABSTRACT

OBJECTIVES:

To compare the effects of lumbar stabilization exercises, Mckenzie exercises and conventional exercises on pain, function and lumbar range of motion in patients with mechanical low back pain.

STUDY DESIGN:

Quasi experimental study design

STUDY SETTING:

Kovai Medical Centre and Hospital- Coimbatore

SAMPLE SIZE AND INTERVENTION:

21 patients with mechanical low back pain who met the inclusion criteria were selected. The duration of the study was 4 weeks.21 patients diagnosed with mechanical low back pain and age group 20-40 years, both males and females were selected. Patients with pain level between 3 and 7 in the numerical pain rating scale were included. 21 randomly allocated into 3 groups- experimental Group A, experimental group B and control group C of 7 samples each. Group A received an exercise pamphlet comprising of 5 lumbar stabilisation exercises, group B received an exercise pamphlet comprising of 5 Mckenzie exercises and group C received an exercise pamphlet comprising of 5 conventional exercises for mechanical low back pain patients which were to be followed at home.

OUTCOME MEASURES:

- Pain status
- Functional ability
- Lumbar flexion range of motion

MEASUREMENT TOOLS:

- Numerical pain rating scale
- Roland Morris functional disability Questionnaire
- Modified Schober's test

CONCLUSION:

The data were analyzed using paired 't' test and one way ANOVA at 5% level of significance. The results of the study concluded that lumbar stabilization group is better than the Mckenzie group and conventional group in reducing the pain, improving the function and increasing the lumbar flexion range of motion.

KEYWORDS:

- Mechanical low back pain
- Lumbar stabilization exercises
- Mckenzie exercises
- Numerical pain rating scale
- Roland Morris functional disability questionnaire
- Modified Schober's test

1. INTRODUCTION

Back pain is an extremely common human phenomena, a price mankind has to pay for their upright posture[34]. It is a neuro- musculoskeletal problem affecting 40% of population worldwide at some point of their life which causes significant disability and loss in productivity. Furthermore, over 80% of low back pain patients report recurrent episodes.

Mechanical low back pain is considered as one of the most frequently treated disease in modern industrial societies and one of the leading cause of work absenteeism[1].

The incidence of mechanical low back pain is higher in workers subjected to heavy physical activities such as weight lifting, repetitive movements and frequent static posture.

Mechanical low back pain can be described as a musculoskeletal pain which varies with physical activities and not involving root compression or series of spinal disease[2].

Causes include lumbar strain, herniated disks, spondylolysthesis, spinal stenosis, spondylosis and fractures. Pain from mechanical causes is typically aggravated with movement and relieved by rest[8].

Diagnosis of mechanical low back pain is made commonly by physical examination, palpation, physical tests and imaging such as x rays, MRI, and CT scan.

Most commonly used management includes medications, physical therapy and surgery. The physical therapy management varies according to the condition of the patient and includes modalities, exercise therapy and patients education with a comprehensive plan of care[3,4,].

Living sedentary life and lack of physical fitness makes human liable to back pain. The cause of lower spine being so commonly affected could be due to inherent skeletal abnormalities, poor posture, inability of lumbar spine musculature to control movements and protect against injury[3,4].

Exercise therapy has three important goals. The first and most important goal of exercise is to improve back flexibility and strength and to improve performance of endurance activities. The second goal is to reduce the intensity of back pain. The third and most important goal is the reduction of back pain related disability.

The Mckenzie method is considered to be a highly effective program for patients with low back pain. It seems to be an effective technique in alleviating back pain compared with other conservative treatment[6].

The core component of treatment in the Mckenzie method of exercise is the sustained postures or repeated movements. It also includes other components such as education and postural training.

Mechanical stability of the lumbar spine is an important consideration in low back injury prevention and rehabilitation strategies[34]. Trunk stabilizing muscles (multifidus, transverse abdominis, internal oblique, erector spinae, rectus abdominis) provide intersegmental stability to the low back. Imbalance between muscles can result in instability of the spine leading to functional dysfunction[7].

Spinal instability is one of the cause of low back dysfunction and this instability of the spine is associated with reduced strength and endurance of the trunk stabilizing muscles and inappropriate recruitment of trunk muscles. So specific training of the stabilizing muscles in low back pain patients are necessary[37].

The main goal of lumbar stabilization program is to built musculature that stabilizes the torso, with co-contraction of abdominal muscles to provide corseting effect on the lumbar spine.

1.1 NEED FOR STUDY

Low back pain is a major health issue with significant socioeconomic implications in many western countries. Currently its prevalence in India is found to be high.

Several treatment strategies like joint mobilization and manipulation, electrotherapy, acupuncture, soft tissue massage techniques and traction are currently utilized in clinical practice. There is ample evidence that active approaches to the rehabilitation of low back patients are beneficial. **In 2000,Van Tulder et al**. published a Cochrane review describing the effectiveness of exercise therapy for low back pain.

Systematic reviews have concluded that stabilization program appears to be effective in some subgroups of patients with back pain. The individual effect of lumbar stabilization exercise is evident in the management of mechanical low back pain, but there is no single study comparing the effectiveness of lumbar stabilization exercises with Mckenzie exercises and conventional exercises.

Evidence based researches showed that the Mckenzie approach resulted in a greater decrease in pain and disability in patients with low back pain. But no study directly compared the effectiveness of Mckenzie exercise with lumbar stabilization exercises and conventional exercises in patients with mechanical low back pain.

So this study intends to compare the efficacy of lumbar stabilization exercises, McKenzie exercises and conventional exercises in patients with mechanical low back pain.

1.2 AIM AND OBJECTIVES

1.2.1 AIM

- To compare the effectiveness of lumbar stabilization exercises, Mckenzie exercises and conventional exercises on pain, function and range of motion in patients with mechanical low back pain.

1.2.2 OBJECTIVES OF THE STUDY

- To study the effect of lumbar stabilization exercises on pain, function and range of motion in patients with mechanical low back pain
- To study the effect of Mckenzie exercises on pain, function and range of motion in a patients with mechanical low back pain
- To study the effect of conventional exercises on pain, function and range of motion in patients with mechanical low back pain
- To compare the effectiveness of Mckenzie exercises, lumbar stabilization exercises and conventional exercises on pain, function and range of motion in patients with mechanical low back pain.
- To implement these techniques in clinical practice.

2. REVIEW OF LITERATURE

2.1. MECHANICAL LOW BACK PAIN

Gorden Wadell (1998)[9]

The mechanical low back pain is characterized by

- Pain is usually cyclic
- Low back pain is often referred to the buttocks and thighs
- Morning stiffness or pain is common
- Start pain (when starting movement) is common
- There is pain on forward flexion and often also on returning to the erect position
- Pain is often produced or aggravated by extension, side flexion, rotation, standing, walking, sitting and exercise in general
- Pain is usually worse over the course of the day
- Pain is relieved by change of position
- Pain is relieved by lying down, especially in the fetal position
- Low back pain lasting more than one day

GBJ Andersson et al (1999)[10]

70 -85% of all people have back pain at some point in life. The annual prevalence of back pain ranges from 15% to 45% with point prevalence averaging 30%. It is the most common cause of activity limitation in people younger than 45 years.

Alf Nachemson and Egon Johnson (2000)

Low back pain was a complex multi facet problem where the patient will be affected physically, psychologically, economically and recreationally. It has reached epidemic proportions.

Brennan (2006)[11]

Long term mechanical low back pain is more difficult to treat and treatment outcomes give variable results and consequently results in both physical and psychological deconditioning that trap the patient in a vicious circle characterized with decreased physical performance, exacerbated nociceptive sensations, depression, impaired social functioning and work disability.

James J (2008)[5]

Mechanical back pain is now more appropriately defined in terms of the spinal structures affected. Any structure within the spine, including the vertebral bodies, intervertebral discs, zygapophysial joints, sacroiliac joints, spinal ligaments, paraspinal muscles, dura, spinal cord and nerves may represent a potential pain generator for mechanical back pain. In the past, diagnosis such as " non specific back pain" or "lumbar strain" were given to the majority of mechanical back pain cases.

Charles E Argoff et al (2008)[12]

Most cases of low back pain resolve with minimal intervention. The main value of a history and physical examination is to determine which patients should be referred for imaging and interventions. The risk factors for progression to chronic back pain are predominantly psychosocial and occupational.

2.2 LUMBAR STABILISATION EXERCISES

Joon Hee MD et al (1999)[14]

A five year prospective study was conducted to investigate trunk muscle weakness as a risk factor for low back pain. The study concluded that an imbalance in trunk muscle i.e. lower extensor muscle strength than flexor muscle strength might be one risk for low back pain.

Carolyn A Richardson et al (2001)[15]

Analysed the long term effects of specific stabilizing exercises in first episode low back pain patients. Long term results suggest that specific exercise therapy in addition to medical management and resumption of normal activity may be more

effective in reducing low back pain recurrences than medical management and normal activity alone.

Ibrahim Magdy Elnaggar et al (2004)

Study compared the effect of lumbar stabilization exercises and flexion-extension exercise program on increasing the range of motion of trunk flexion, extension, right bending, left bending, reduction of pain severity and reduction of functional disability. The lumbar stabilization exercises are more effective than the combined flexion- extension exercises in reducing low back pain severity and functional disability and are recommended to be used for patients with chronic mechanical low back pain.

Ros Johnson et al (2008)[13]

A systematic review was published to evaluate the effectiveness of stabilization exercises in the treatment of pain and dysfunction from low back pain. They concluded that there may be a role for specific stabilization exercises in some patients with chronic low back pain.

Fabio Renovato Franca et al (2010)[16]

On a comparative study to find the efficacy of two exercise programs, segmental stabilization and strengthening of abdominals and trunk muscles on pain, function, disability and activation of transverse abdominis muscle in individuals with chronic low back pain, both techniques lessens pain and reduced disability. Segmental stabilization is superior to superficial strengthening for all variables. Superficial strengthening does not improve transverse abdominis capacity.

2.3 MCKENZIE EXERCISES

Stanley A Herring et al (1991)[17]

The Mckenzie exercises cause reduction of symptoms with repetitive extension on motion pattern testing and pain centralizes with extension. They reduce

intra discal pressure, allow anterior migration of nucleus pulposus and increase mechanoreceptor input.

John A Mcculloch et al (1999)

The Mckenzie program was designed to shift the nucleus pulposus forwards in the disc cavity, reducing its pressure effects on the posterior annulus and nerve roots. An effective extension program centralizes pain that reduces the radiating pain.

Lance T Twomey et al (2000)[18]

The Mckenzie patients resolve their acute episode and disability faster and were better able to prevent recurrences and were able to minimize disability when symptoms did recur. The Mckenzie's individualized end range movements chosen on the basis of centralization were as effective as manipulation in reducing pain[18].

Luciana AC Machado et al (2005)[19]

Designed a randomized controlled trial to evaluate whether the addition of the Mckenzie method to general practitioner care results in better outcomes than general practitioner care alone in patients with acute low back pain.

Brian M Busanich et al (2006)[20]

Did a study to find the clinical evidence base for Mckenzie therapy in management of back pain. They found that Mckenzie therapy results in short term(<3 months) pain and disability for low back pain patients compared with other standard treatments such as NSAIDS, educational booklet, back massage, back care advice, strength training and spinal mobilization under therapist supervision.

Alassandra Narciso Garcia et al (2013)[21]

Compared the effectiveness of back school and Mckenzie methods in patients with chronic non specific low back pain. The primary outcome measures were pain intensity and disability. It was found that the Mckenzie method was slightly more

effective than the back school method for disability, but not for pain intensity immediately after treatment in participants with chronic low back pain.

2.4 CONVENTIONAL EXERCISES

Julie Barber et al (1999)[22]

Evaluated the effectiveness of an exercise program in a community setting for patients with low back pain to encourage a return to normal activities. The exercise group was more clinically effective than traditional general practitioner management, regardless of patient preference and was cost effective.

Van Tuddler et al (2000)[23]

Published a Cochrane review of literature assessing the effect of exercise therapy for low back pain in pain intensity, functional status, overall improvement and return to work. He concluded that exercise therapy was effective in decreasing pain and improving function in patients with chronic low back pain.

G David Baxter et al (2003)[24]

Aim of this review was to investigate current evidence for the type and quality of exercise being offered to chronic low back pain patients, within randomized controlled trial and assess how treatment outcomes are being measured. Exercise has a positive effect on low back pain patients and strengthening is a common component of exercise programs.

Jill Hayden et al (2011)

Conducted a study to evaluate the effectiveness of exercise therapy in non specific, acute, sub acute, and chronic low back pain and concluded that it is slightly effective in decreasing pain and improving function in patients with chronic low back pain.

2.5. NUMERICAL PAIN RATING SCALE

James P Young et al (2001)[27]

Pain intensity was usually measured on an 11 point pain intensity numerical rating scale where zero is no pain and ten was the worst possible pain .The use of NPRS as a standard outcome across chronic pain studies would greatly enhance the comparability, validity and clinical applicability of the studies.

Childs et al (2005)[26]

They did a cohort study in patients with low back pain receiving physical therapy. It was found out that a 2 point change in the NPRS represents clinically meaningful change.

Williamson and Hogart et al (2005)[25]

Analysed a study to check the validity and reliability of three pain rating scales: numerical pain rating scale, verbal rating scale and visual analogue scale. It was concluded that, for general purposes, the numerical pain rating scale has a good sensitivity and generated data that can be statistically analyzed for audit purposes.

2.6. ROLAND MORRIS FUNCTIONAL DISABILITY QUESTIONNAIRE

Roland et al (1993)[28]

The Roland –Morris Questionnaire was one of the most widely used questionnaires which have been designed for back pain. It has been shown to yield reliable measurements, which are valid for inferring the level of disability, and to be sensitive to change over time for groups of patients with low back pain.

Deyol DM et al (1998)[[29]

The oswestry disability index and roland morris disability questionnaire are hands-down the most commonly used and recommended outcome measure tools used for assessing the disabling effects of lumbar spine disorders.

Turner JA et al (2003)[30]

Compared the Roland Morris Disability Questionnaire to widely used generic health status measures in a sample of workers with recent work- related back injuries in terms of validity, reliability, responsiveness to change and floor and ceiling effects. The roland morris disability questionnaire demonstrated excellent internal consistency and validity through correlations with other measures of physical functioning, ability to discriminate between those working and those not working.

Kuijer W et al (2005)[31]

A 24 –item, self reported, disability scale specific to back pain recommended for use in primary care and community studies. Measures daily function in completing activities affected by back pain. The scale score ranges from 0 (no disability) to 24 (severe disability).

2.7. MODIFIED SCHOBER'S TEST

Gill K et al (1988)

The modified schober's method of determining lumbar spinal motion was the most easily repeatable and was recommended for a routine, non invasive, clinical evaluation of lumbar spinal motion.

Marcia et al (1995)[33]

Analyzed for two groups of subjects during forward bending. Group 1 contained people with a history of low back pain and group 2 without a history of low back pain. The results of this study suggested that although people with a history of low back pain have amounts of lumbar spine and hip motion during forward bending similar to those of healthy subjects, the pattern of motion was different.

Robinson et al (2014)[32]

Did a study on "assessments of lumbar flexion range of motion: inter tester reliability and concurrent validity of two commonly used clinical tests". It concluded that modified Schober's test has excellent inter tester reliability and could be used for measuring lumbar flexion range of motion.

3. MATERIALS AND METHODOLOGY

3.1 RESEARCH DESIGN

Quasi-experimental study design

3.2 STUDY POPULATION

Mechanical low back pain patients

3.3 SAMPLING TECHNIQUE

Non probability purposive sampling

3.4 SAMPLE SIZE

- 21 samples: 7 in each group
- GROUP A = 7 samples – Experimental Group
- GROUP B = 7 samples – Experimental Group
- GROUP C = 7 samples – Control group

3.5 STUDY DURATION

6 Months.

3.6 STUDY SETTING

Kovai Medical Center & Hospital, Coimbatore

3.7 STUDY CRITERIA

3.7.1 INCLUSION CRITERIA

- Age: 20-40 years

- Both gender
- Pain level- NPRS between 3 and 7
- Low back pain (1 week-3 month)
- Mechanical low back pain patients

3.7.2 EXCLUSION CRITERIA

- Radiating pain such as Sciatica, Disc prolapse
- Disc protrusion
- Neurological involvement
- Postural deformities
- Recent surgeries of lumbar region
- Spinal fractures
- Diseases of spine (ankylosing spondylosis, TB spine etc)
- Malignancy of spine
- Infection of spine
- Cardiovascular and neurological problems
- Sacro-iliac joint strain

3.8 HYPOTHESIS

3.8.1 NULL HYPOTHESIS

- H_{01}-There is no significant effect of lumbar stabilization exercises on pain, function and range of motion in patients with mechanical low back pain.
- H_{02}-There is no significant effect of Mckenzie exercises on pain, function and range of motion in patients with mechanical low back pain.
- H_{03}-There is no effect of conventional exercises on pain, function and range of motion in patients with mechanical low back pain.
- H_{04}-There is no significant difference between Mckenzie exercises, lumbar stabilization exercises and conventional exercises on pain, function and range of motion in patients with mechanical low back pain.

3.9 OUTCOME MEASURES

- Pain status
- Lumbar flexion range of motion

- Functional ability

3.10 MEASUREMENT TOOLS

- Numerical pain rating scale
- Modified Schober's test
- Roland Morris Functional Disability Questionnaire

3.11 PROCEDURE

- 30 patients with mechanical low back pain who fulfilled the inclusion criteria were recruited for the study by purposive sampling technique and provided with written consent form.
- They were divided into experimental group and control group.
- Experimental group consist of group A and group B with 7 patients each and control group consist of 7 patients.
- Group A received lumbar stabilization exercises.
- Group B received Mckenzie exercises.
- Group C received Conventional exercises.
- Back care programme were taught to all the patients.
- Lumbar stabilization exercises, Mckenzie exercises and conventional exercises were demonstrated to the patient respectively.
- Patients were asked to come to the department for two alternative days in the first week and they were asked to continue the exercises as home programme.
- The exercises to be performed at home, was given in a pamphlet to the patient with clear instructions in both English and Tamil.
- The researcher maintained contact with the patient by means of a telephone call every third day in a week till the intervention ended.
- The patients were advised to contact the researcher at anytime during the intervention in case of any difficulty.

- Then the patient was later asked to come by the end of the forth week to the department for taking thepost treatment assessment.
- Thus clinical outcomes of Numerical Pain Rating Scale, Roland Morris Disability Index Questionnaire and Modified Schober's test were assessed on all participants at baseline and post treatment.

3.12 INTERVENTION

GROUP A: TRUNK STABILIZATION EXERCISE GROUP

Note: In the trunk stabilization exercise group, prior to each exercise, patient was instructed to contract his abdominal muscles, while continuing to breathe in a normal pattern and by maintaining the contraction, he was asked to perform the exercises.

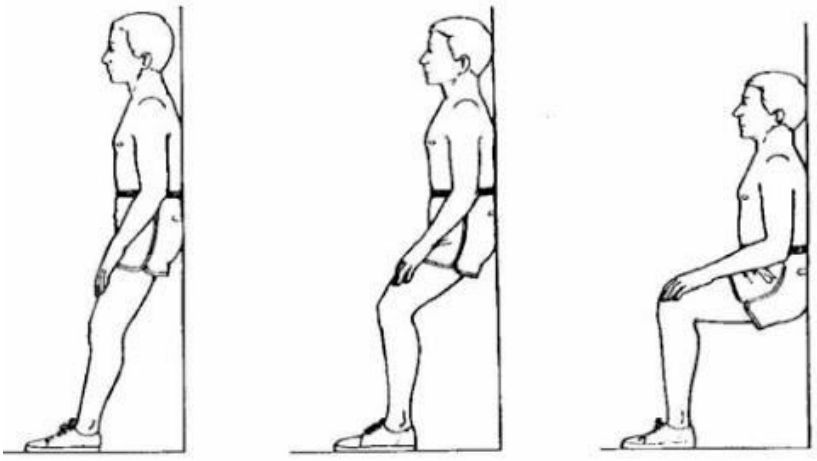
Frequency: two times a day

Repetitions: 10 times

Rest period: 5 min after each exercise

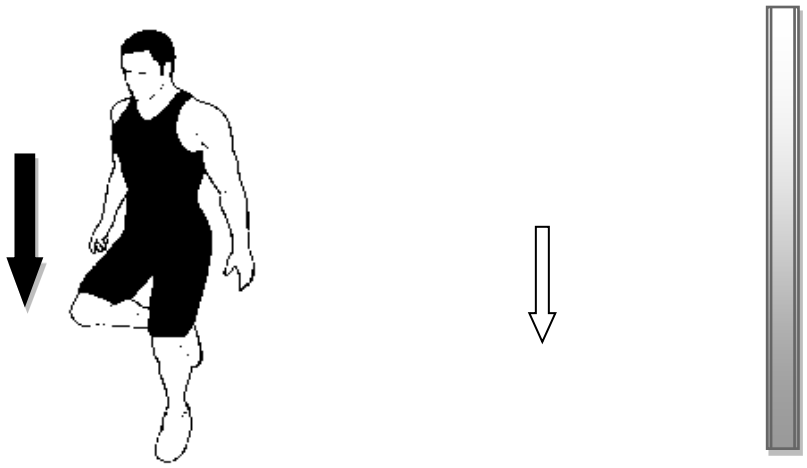
- **Wall slides**:

Week 1-2: Patient was asked to stand upright with the back against a wall and feet shoulder width apart. Then he /she was asked to slowly bend the knees sliding the back down the wall half the way to the ground and hold it for 5 seconds. Then patient was asked to straighten the knees by slowly sliding up the wall until he is fully upright with knees straight.



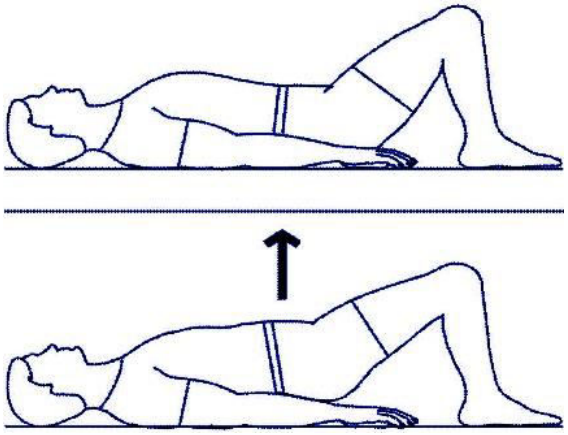
Progression of the exercise:

Week 3-4: Same exercise with only one knee. (lift the other leg and hold it)



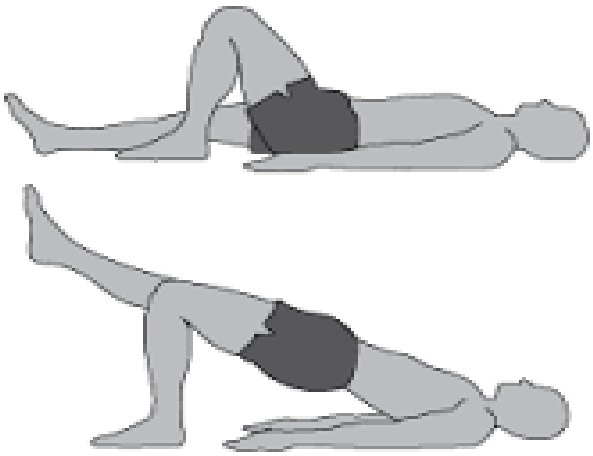
- **Pelvic bridging:**

  Week 1-2: Patient was asked to lie on the back with the hip and knees bent and lift the buttocks up and away from the couch. He /she was asked to hold this position for 10 sec and relax.



Progression of the exercise:

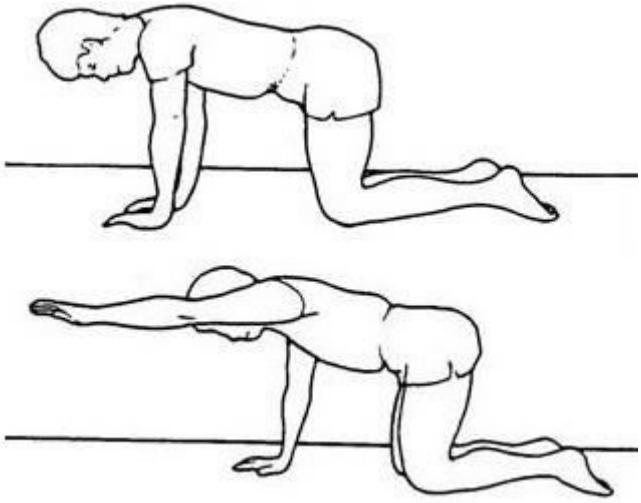
Week 3-4: lift the buttocks up and away from the couch and holding this position, lift one leg.



- **Alternate arm and**

leg(quadruped position):

Week 1-2: Initially patient was asked to maintain quadruped position. Then he/ she was asked to lift one of the arms, hold this position for 10 seconds and relax.



Likewise the, patient was asked to lift one leg slowly, and hold the position for 10 seconds and relax.

Progression of the exercise:

Week 3-4: Once after the quadruped position was maintained, patient was asked to extend alternate arm and leg and was asked to hold the position for 10 seconds and relax.

- **Abdominal curl ups:**

Week 1-2: Patient was asked to lie on their back with knees bent and feet flat on the floor. Then he/she was asked to lift the head and shoulders off the bed and try to touch the knee with the hands, hold the position for 10 seconds and relax.

Progression of the exercise:

Week 3-4: lift the head and shoulders with hands across the chest.

GROUP B: MCKENZIE EXERCISE GROUP

Frequency: 2 times a day

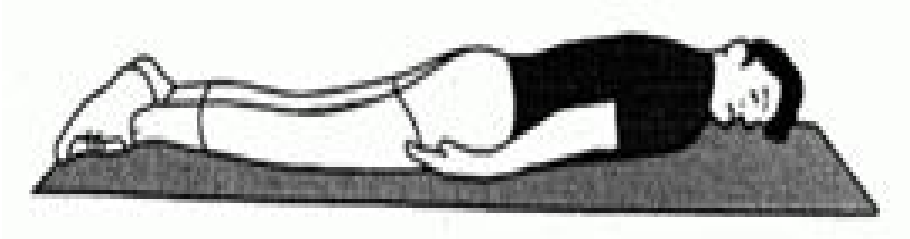
Repetition: 15 times

Rest interval: 5 minutes after each exercise.

Week 1-2:

- **Lying on the stomach:**

Patient was asked to lie on their stomach with arms beside the body and head turned to one side and maintain the position for 4-5 minutes.

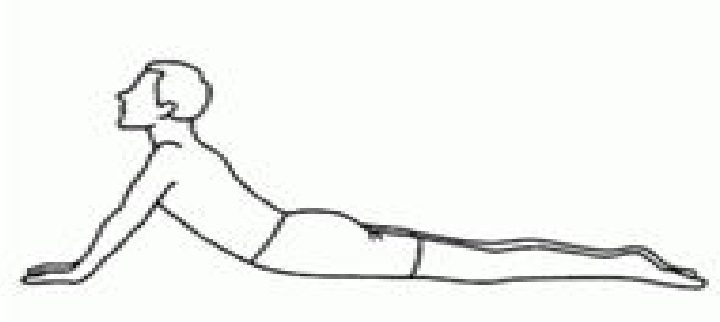


- **Extension in prone lying:**

Patient was asked to lie on their stomach and support the upper body while keeping their forearm flat on the bed. Then he / she was asked to lift the head as far as possible and hold it for 10 seconds.

- **Extension in prone lying:**

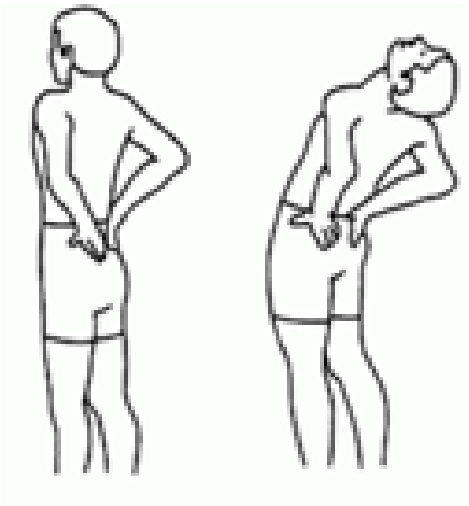
Patient was asked to push up their upper body with the palms of the hands on the floor just in front of the shoulders and straighten the elbows elevating the upper part of the body, while the hips and thigh remains relaxed and hold the position for 10 seconds.



Week 3-4: (along with all the above exercises)

- **Extension in standing:**

The patient was asked to stand upright with feet slightly apart, hands placed at the back so that fingers are pointed towards the floor and thumb forwards. The patient bends backward at the waist as far as they can keeping the knees straight, maintaining this position for 5 seconds and return to the starting position.



- **Flexion in sitting:**

Patient was asked to sit on a chair, with knees and hips at 90 degrees, and asked to bend the trunk forwards and hands close to the floor as possible. Then he / she were asked to hold on to the ankle, bringing the trunk even close to the knees and maintain the position for 5 seconds.

GROUP C: CONVENTIONAL EXERCISE GROUP

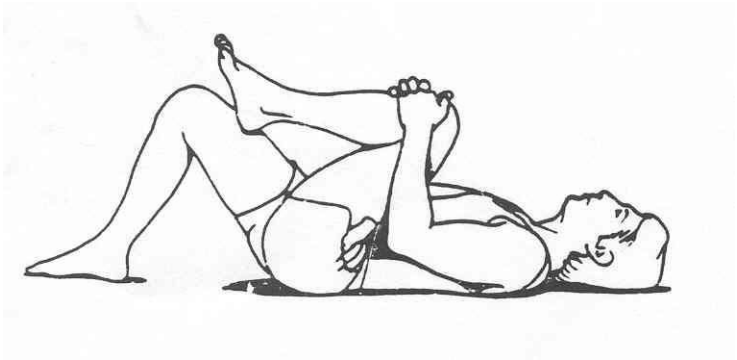
Frequency: 2 times a day

Rest period: 5 minutes after each exercise

- **Single knee to chest exercise:**

Week 1-2: patient was asked to lie supine with their knees bent and feet flat on the floor. Then he /she was asked to clasp one of the knee with both the hands and pull it towards their chest , hold this position for 5 seconds and relax.

No of repetitions: 10 times for each leg.



Progression of the exercise:

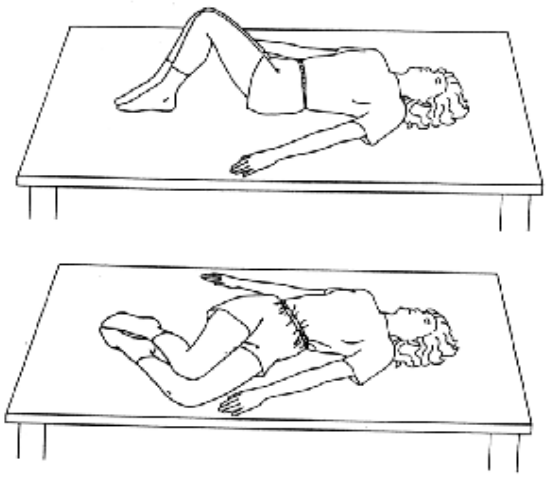
Week 3-4: same exercise, hold it for 10 seconds.

No of repetitions: 15 times for each leg

- **Lying trunk rotation:**

  Week 1-2: patient was asked to lie on their back with hips and knees bent, feet flat on the floor and arms straight beside the body. Then he / she was asked to slowly rotate their both legs to one side and then to the opposite side.

  No of repetitions: 10 times



Progression of the exercise:

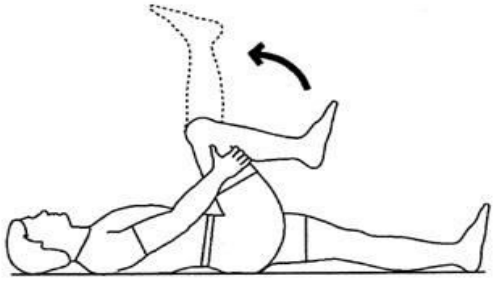
Week 3-4: same exercise

No of repetitions: 15 times

- **Hamstring stretches:**

Week 1-2: patient was asked to lie on their back, clasp the hands under the thigh and to keep it vertically straight. Then he/she was asked to lift the leg up as far as possible, hold the position for 10 seconds and relax.

No of repetitions: 5 times for each leg



Progression of the exercise:

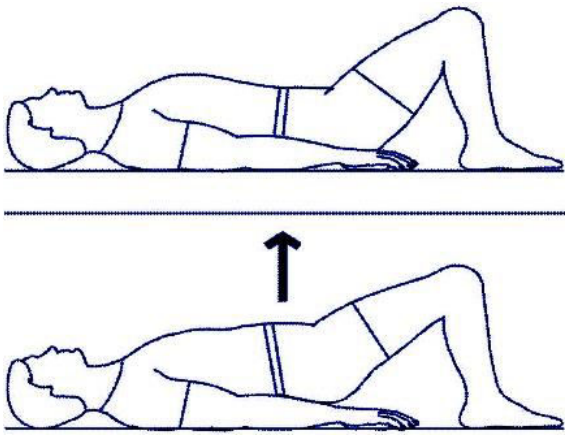
Week 3-4: same exercise

No of repetitions: 10 times for each leg

- **Pelvic bridging:**

  Week 1-2: Patient was asked to lie on the back with the hip and knees bent and lift the buttocks up and away from the couch. He /she was asked to hold this position for 10 sec and relax.

  No of repetitions: 10 times



Progression of the exercise:

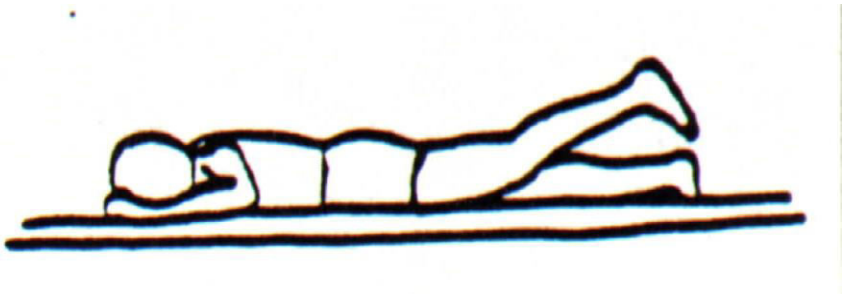
Week 3-4: same exercise

No of repetitions: 15 times

- **Prone straight leg raise:**

  Week 1-2: patient was asked to lie on their stomach, lift the leg up from the hip, with the knees straight and hold it for 10 seconds.

  No of repetitions: 10 times for each leg



Progression of the exercise:

Week 3-4: same exercise

No of repetitions: 15 times for each leg

3.12.1 INTERVENTION DURATION

The intervention duration was 4 weeks in which the patient performed the exercises.

FREQUENCY: Once a day within 30-40 minutes.

REST INTERVAL: The patients were asked to perform deep breathing thrice during the carryover from one exercise to another and also during the exercises, to avoid the breath holding.

SPEED: The patients did the exercises at a self selected, comfortable pace.

3.13 PHOTOGRAPHIC PRESENTATION

FIGURE NO : 3.13.1

MODIFIED SCHOBER'S TEST

EXPERIMENTAL GROUP-LUMBAR STABILISATION EXERCISES

FIGURE NO: 3.1.2 -WALL SLIDES

FIGURE NO: 3.1.3 - PELVIC BRIDGING WITH LEG RAISE

FIGURE 3.1.4 -ALTERNATE ARM AND LEG (QUADRIPED)

FIGURE 3.1.5 - ABDOMINAL CURL UPS

EXPERIMENTAL GROUP: MCKENZIE EXERCISES

FIGURE 3.1.6 - EXTENSION IN PRONE LYING

FIGURE 3.1.7 - EXTENSION IN PRONE LYING

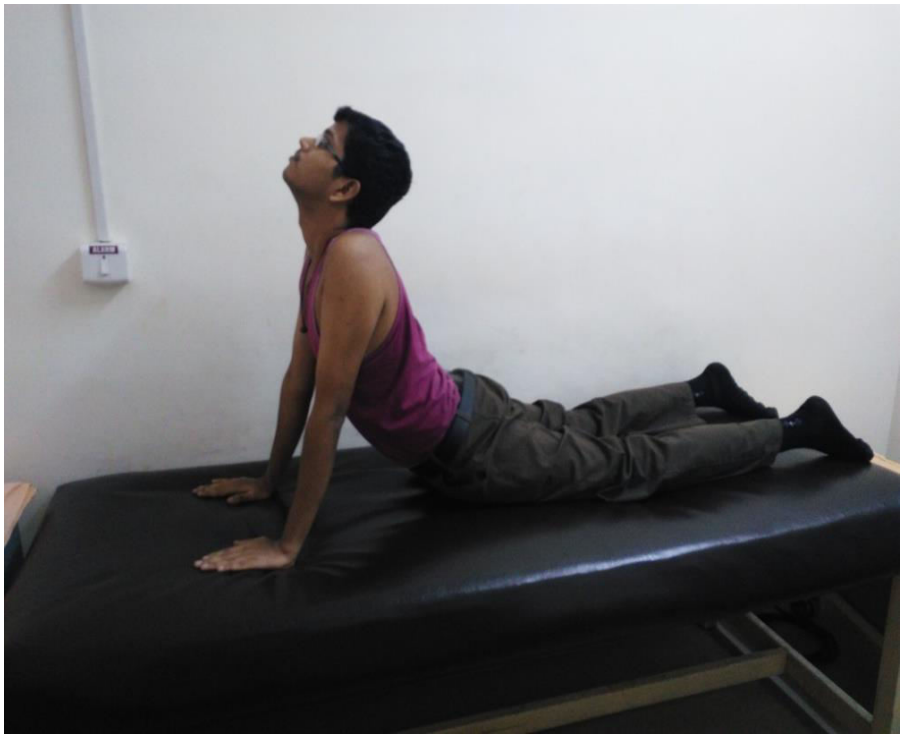


FIGURE 3.1.8 - EXTENSION IN STANDING

FIGURE 3.1.9 - FLEXION IN SITTING

3.14 STATISTICAL TOOLS

a) Paired 't' Test

b) One way ANOVA

3.13.1 PAIRED 't' TEST (within groups)

- Post-test values of the study are collected and assessed for variation in each group and the results are analyzed using paired 't'test.

$$\mathbf{t} = \frac{\bar{d}\sqrt{n}}{S}$$

$$\text{where, } S = \sqrt{\frac{\sum d^2 - [\bar{d}]^2 \times n}{n-1}}$$

- **S** = Combined standard deviation
- **d_1 & d_2** = difference between initial and final readings in group A & B
- **n_1 & n_2**= number of patients in group A & group B
- **X_1 & X_2** = mean of group A & group B

3.13.2 ONE WAY ANOVA

SOURCE OF VARIATION	SQUARED VARIATION	DEGREE OF FREEDOM	MEAN SUM OF SQUARES	F RATIO
SUM OF SQUARES BETWEEN SAMPLE	SSC	C-1	MSC=SSC/C-1	F=MSC/MSE
SUM OF SQUARES WITHIN SAMPLE	SSE	N-C	MSE=SSE/N-C	

- SSC = $\sum (\overline{X1} - \overline{X1})^2 + \sum(\overline{X2} - \overline{X2})^2 + \sum(\overline{X3} - \overline{X3})^2$
- SSC = $\sum (X1 - \overline{X1})^2 + \sum(X2 - \overline{X2})^2 + \sum(X3 - \overline{X3})^2$
- C= number of sample
- N= Total number of items in all sample groups
- MSC=Calculation of mean sum of squares between sample
- MSE= calculation of mean sum of squares within sample.
- Level of significance is 5%

4. DATA PRESENTATION

4.1 TABULAR PRESENTATION

4.1.1 PAIRED 't' TEST: GROUP A- LUMBAR STABILISATION GROUP

TABLE NO: 4.1.1.1- NUMERICAL PAIN RATING SCALE

Outcome measure	Mean value		Calculated 't' Value	Table 't' Value	Level of Significance
	Pre-test	Post-test			
Numerical Pain Rating Scale	5.571	2.285	6.227	2.44	P < 0.05 Significant

TABLE NO: 4.1.1.2- ROLAND MORRIS DISABILITY QUESTIONNAIRE

Outcome measure	Mean value		Calculated 't' value	Table 't' value	Level of significance
	Pre-test	Post-test			
Roland Morris Disability Questionnaire	14.142	7	8.914	2.44	P < 0.05 Significant

TABLE NO: 4.1.1.3- LUMBAR FLEXION RANGE OF MOTION

Outcome measure	Mean value		Calculated 't' value	Table 't' value	Level of significance
	Pre-test	Post-test			
Lumbar Flexion Range Of Motion	4.18	5.285	9.537	2.44	P < 0.05 Significant

4.1.2 GROUP B- MCKENZIE GROUP

TABLE NO: 4.1.2.1 NUMERICAL PAIN RATING SCALE

Outcome measure	Mean Value		Calculated 't' value	Table 't' value	Level of significance
	Pre-test	Post-test			
Numerical Pain Rating Scale	5.714	3.571	6.280	2.44	P < 0.05 Significant

TABLE: 4.1.2.2 ROLAND MORRIS DISABILITY QUESTIONNAIRE

Outcome measure	Mean value		Calculated 't' value	Table 't' value	Level of Significance
	Pre-test	Post-test			
Roland Morris Disability Questionnaire	14.285	9.857	6.813	2.44	P < 0.05 Significant

TABLE 4.1.2.3 LUMBAR FLEXION RANGE OF MOTION

Outcome measure	Mean value		Calculated 't' Value	Table 't' Value	Level of Significance
	Pre-test	Post-test			
Lumbar Flexion Range Of Motion	4.84	5.457	2.974	2.44	P < 0.05 Significant

4.1.3 CONVENTIONAL GROUP

TABLE NO: 4.1.3.1- NUMERICAL PAIN RATING SCALE

Outcome measure	Mean value		Calculated 't' Value	Table 't' Value	Level of Significance
	Pre-test	Post-test			
Numerical Pain Rating Scale	5.57	4	5.279	2.44	P < 0.05 Significant

TABLE NO: 4.1.3.2- ROLAND MORRIS DISABILITY QUESTIONNAIRE

Outcome measure	Mean value		Calculated 't' Value	Table 't' Value	Level of Significance
	Pre-test	Post-test			
Roland Morris Disability Questionnaire	13.285	10.428	7.068	2.44	P < 0.05 Significant

TABLENO: 4.1.3.3- LUMBAR FLEXION RANGE OF MOTION

Outcome measure	Mean value		Calculated 't' Value	Table 't' Value	Level of Significance
	Pre-test	Post-test			
Lumbar Flexion Range of Motion	4.985	5.214	2.431	2.44	P >0.05 Not Significant

4.1.4 ONE WAY ANOVA

TABLE NO: 4.1.4.1 PRE TEST-NUMERICAL PAIN RATING SCALE

Source of variation	Sum of Squares	Df	Mean Square	Calculated F value	Table f value	Level of significance
Between Samples	0.094	2	0.047	0.050	3.55	p>5% Not Significant
Within Samples	16.889	18	0.938			

TABLE NO :4.1.4.2 POST TEST: NUMERICAL PAIN RATING SCALE

Source of variation	Sum of Squares	Df	Mean Square	Calculated F value	Table f value	Level of significance
Between Samples	11.142	2	5.571	5.851	3.55	p<5% Significant
Within Samples	17.144	18	0.952			

TABLE NO:4.1.2.3

PRE TEST:ROLAND MORRIS FUNCTIONAL DISABILITY QUESTIONNAIRE

Source of variation	Sum of Squares	Df	Mean Square	Calculated F value	Table f value	Level of significance
Between Samples	4.0	2	2.047	0.927	3.55	p>5% Not Significant
Within Samples	39.715	18	2.206			

TABLE NO:4.1.2.4

POST TEST: ROLAND MORRIS FUNCTIONAL DISABILITY QUESTIONNAIRE

Source of variation	Sum of squares	Df	Mean square	Calculated F value	Table f value	Level of significance
Between Samples	47.237	2	23.618	13.909	3.55	p<5% Significant
Within Samples	30.573	18	1.698			

TABLE NO: 4.1.2.5

PRE TEST: LUMBAR FLEXION RANGE OF MOTION

Source of variation	Sum of squares	Df	Mean square	Calculated F value	Table f value	Level of significance
Between Samples	4.095	2	2.047	0.927	3.55	p>5% Not Significant
Within Samples	39.715	18	2.206			

TABLE NO: 4.1.2.6

POST TEST: LUMBAR FLEXION RANGE OF MOTION

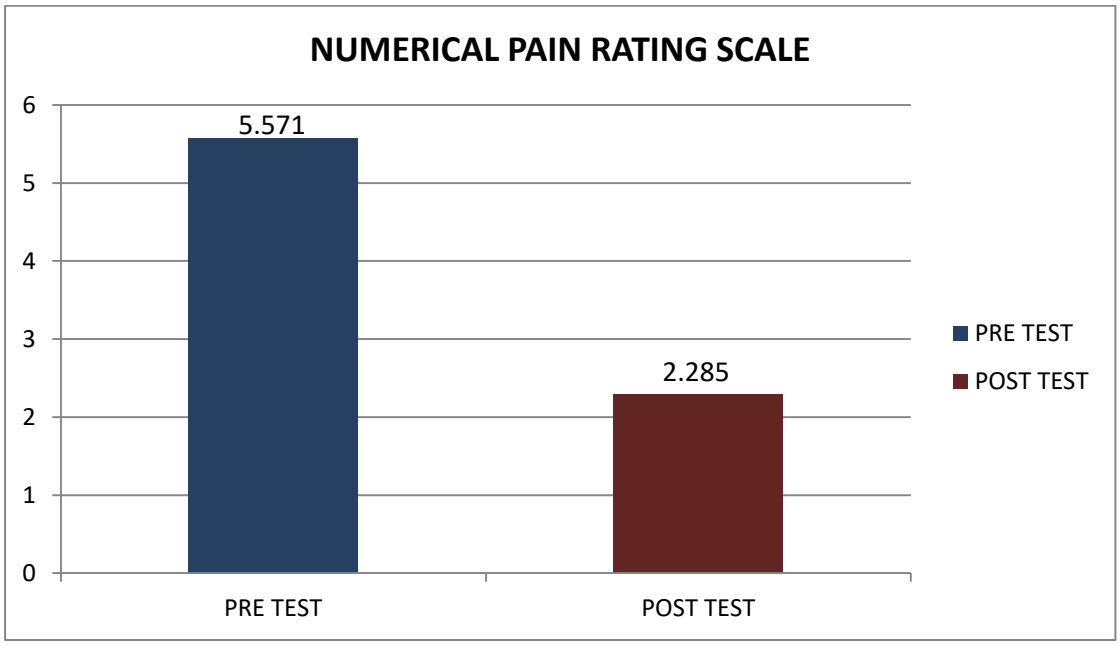
Source of variation	Sum of squares	Df	mean square	Calculated F value	Table F value	Level of significance
BETWEEN SAMPLES	0.217	2	0.108	4.01	3.55	p<5% Significant
WITHIN SAMPLES	7.836	18	0.435			

4.2 GRAPHICAL REPRESENTATION

GROUP A: LUMBAR STABILISATION GROUP

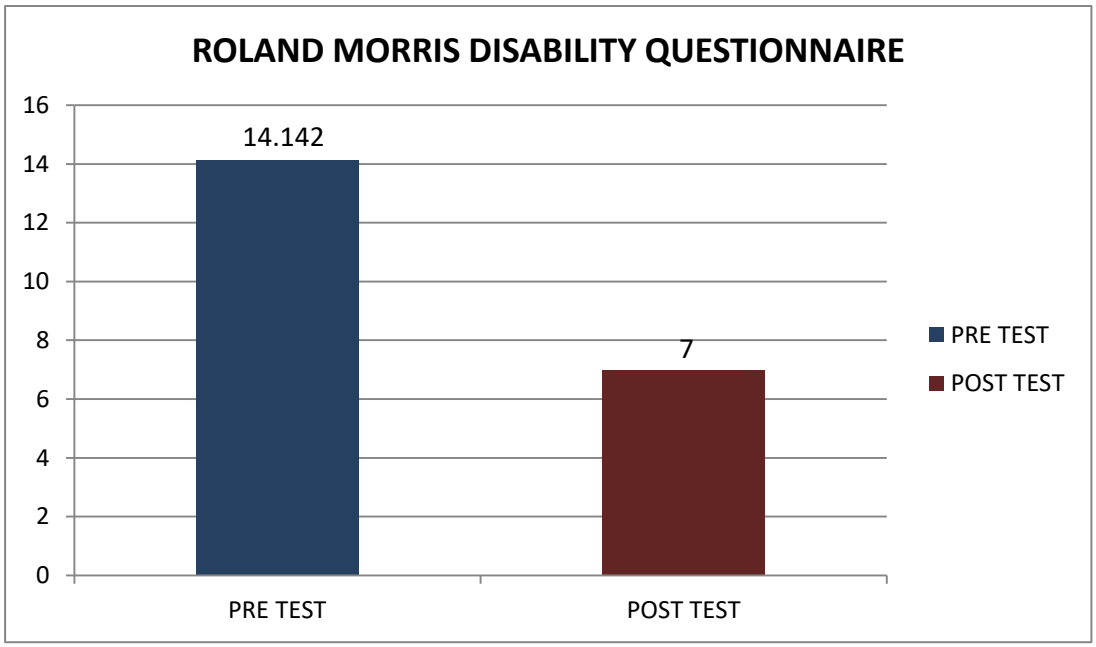
4.2.1 NUMERICAL PAIN RATING SCALE

PAIRED 't' TEST



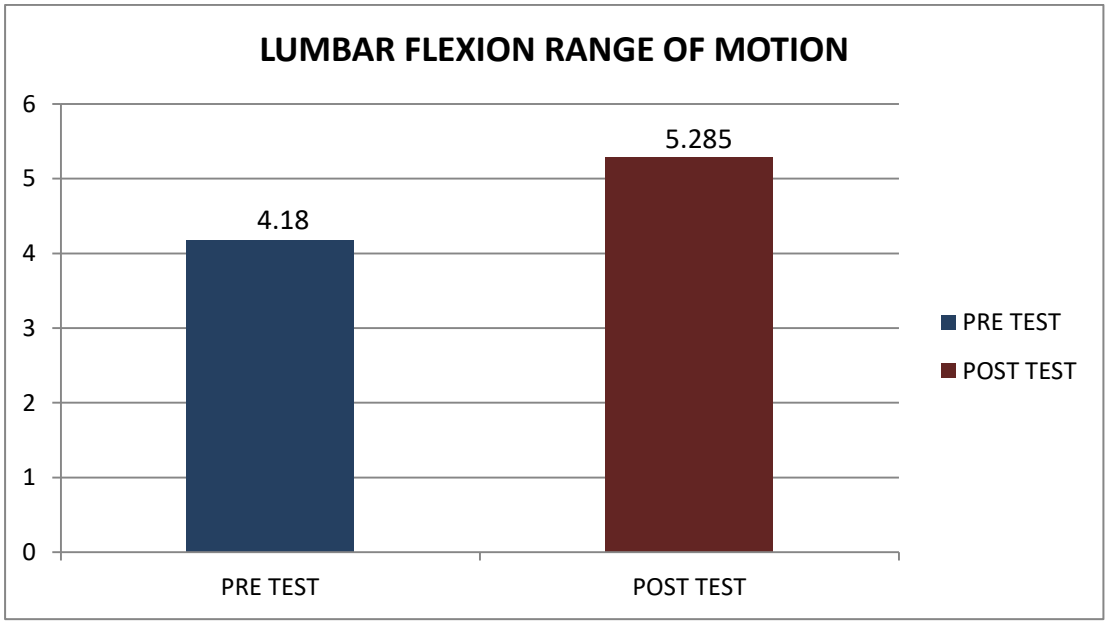
4.2.2 ROLAND MORRIS DISABILITY QUESTIONNAIRE

PAIRED 't' TEST



4.2.3 LUMBAR FLEXION RANGE OF MOTION

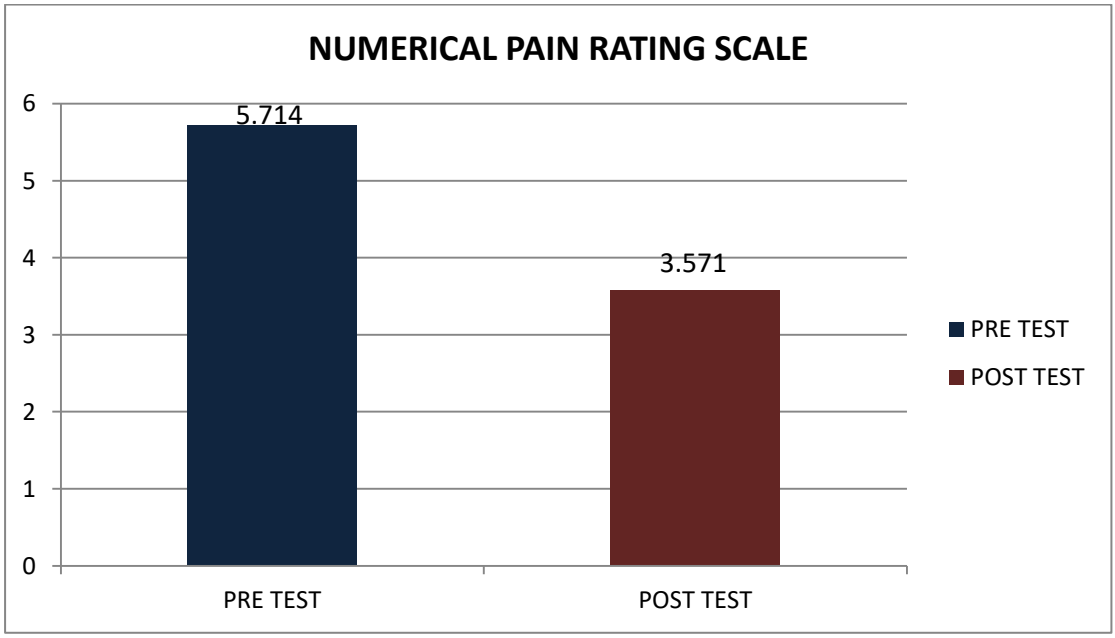
PAIRED 't' TEST



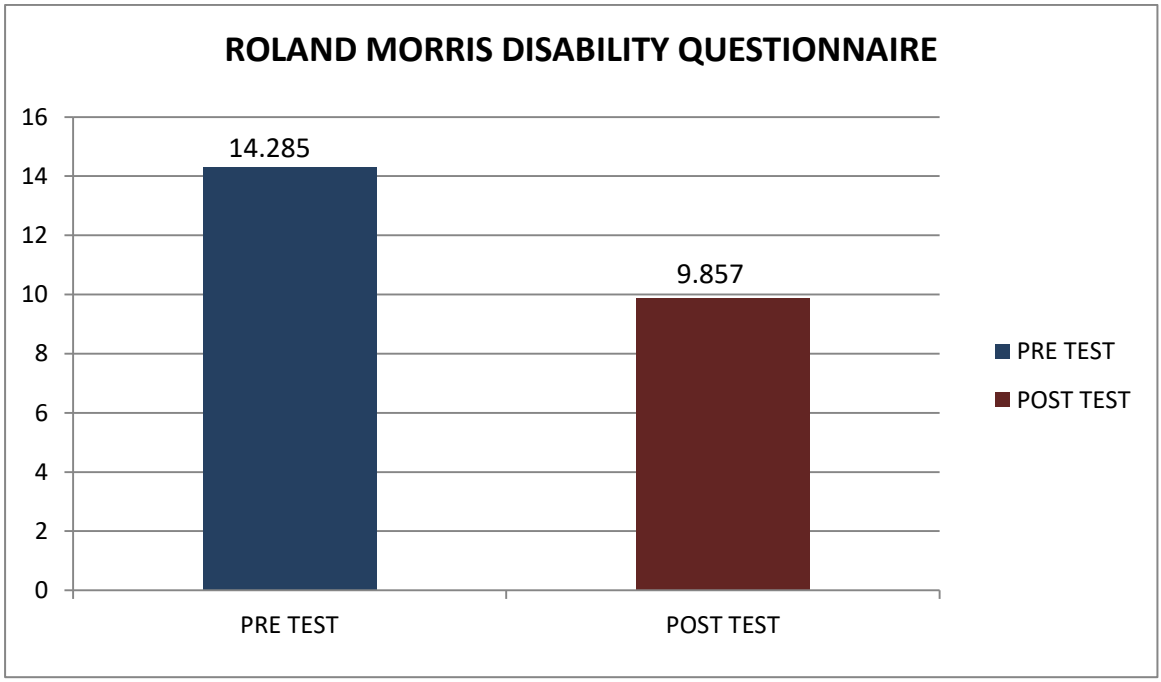
GROUP B: MCKENZIE GROUP

4.2.4 NUMERICAL PAIN RATING SCALE

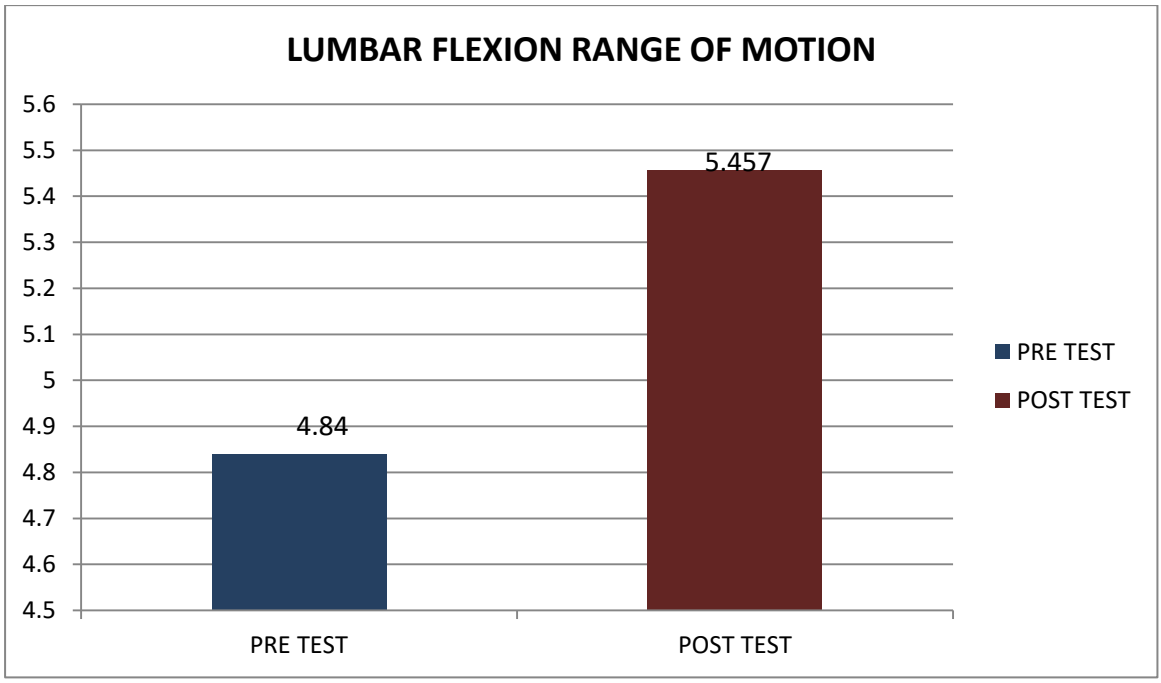
PAIRED 't' TEST



4.2.5 ROLAND MORRIS DISABILITY QUESTIONNAIRE PAIRED 't' TEST



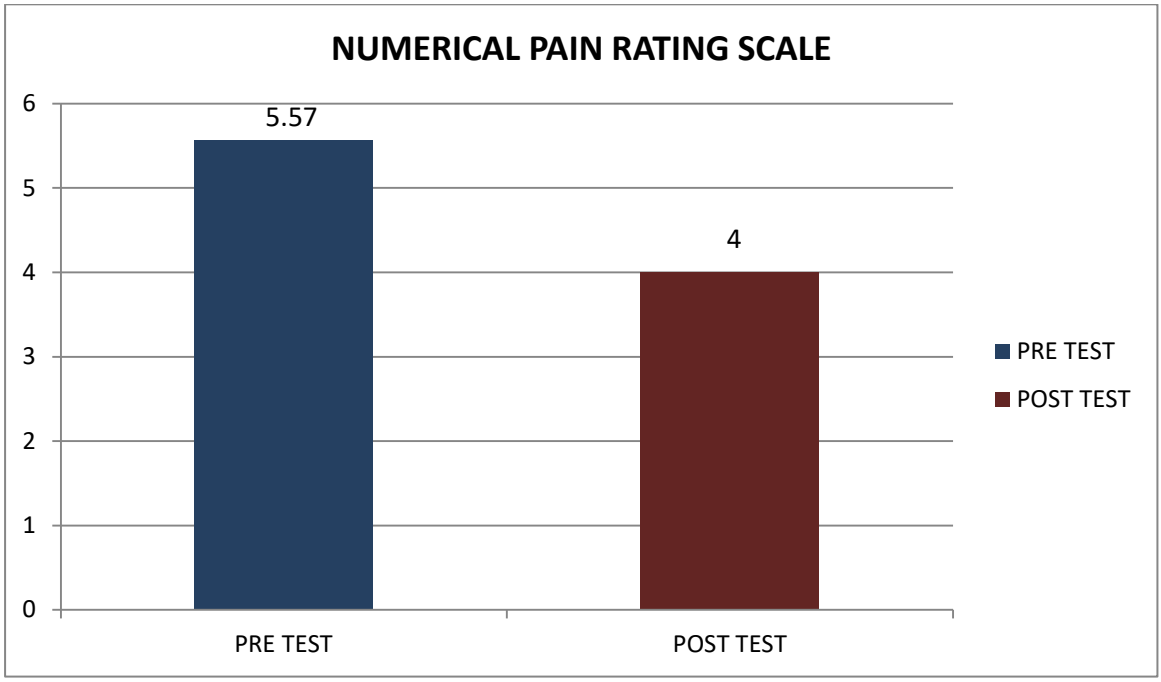
4.2.6 LUMBAR FLEXION RANGE OF MOTION PAIRED 't' TEST



GROUP C: CONVENTIONAL GROUP

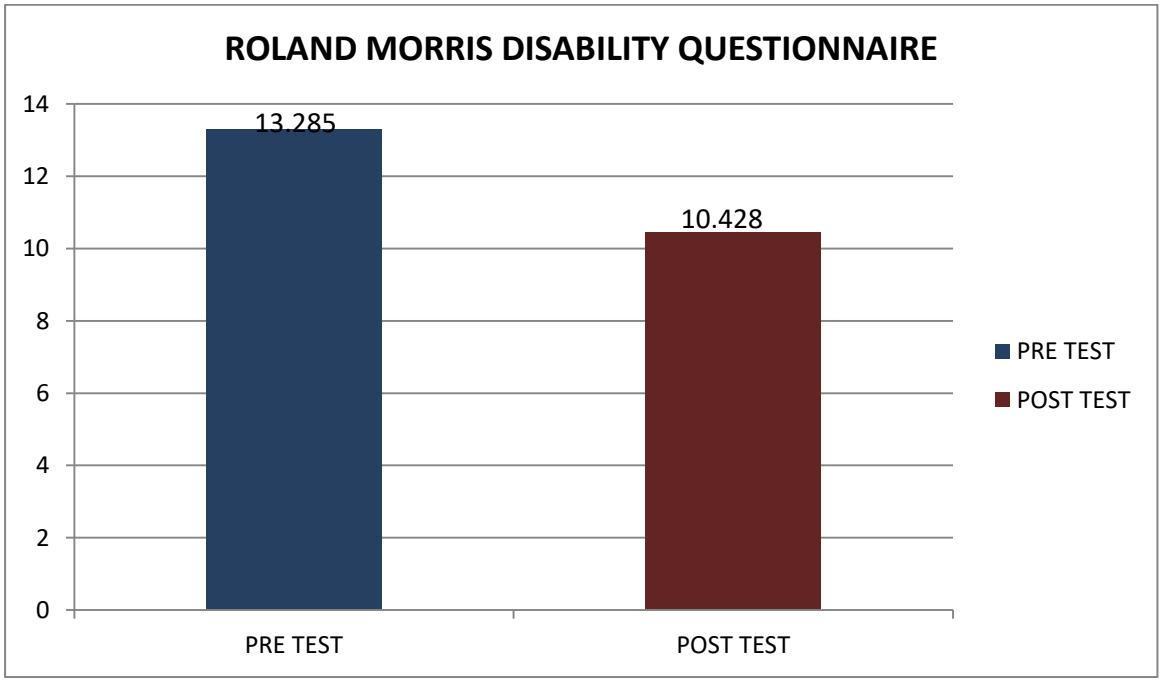
4.2.7 NUMERICAL PAIN RATING SCALE

PAIRED 't' TEST



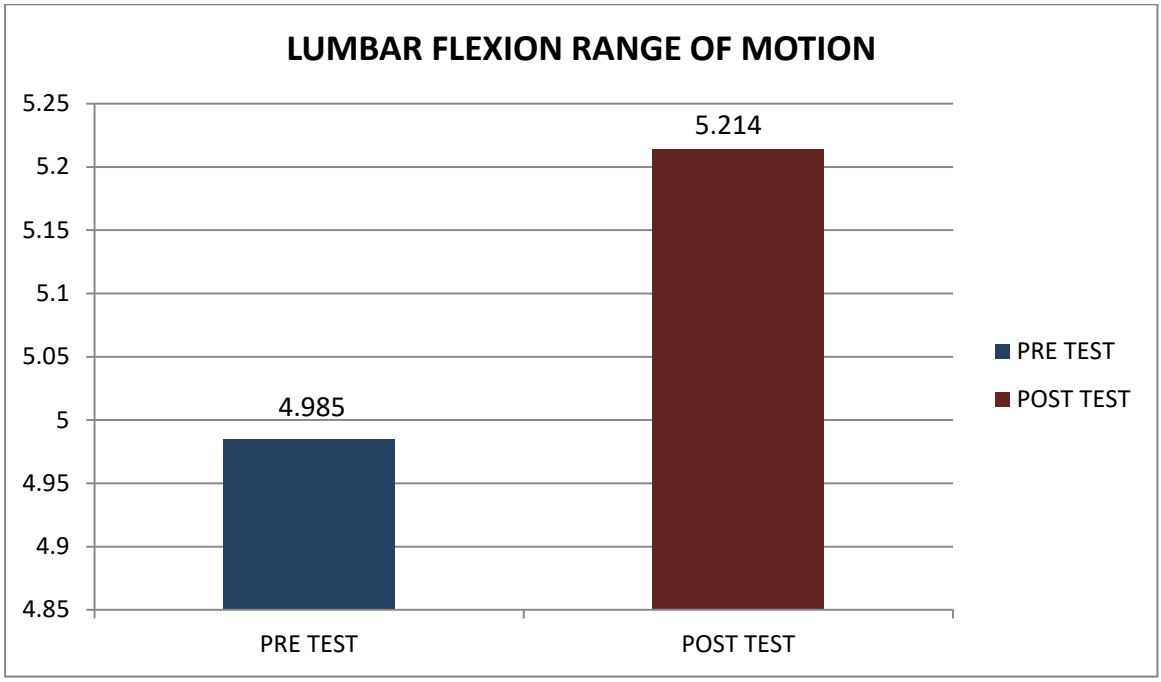
4.2.8 ROLAND MORRIS DISABILITY QUESTIONNAIRE

PAIRED 't' TEST



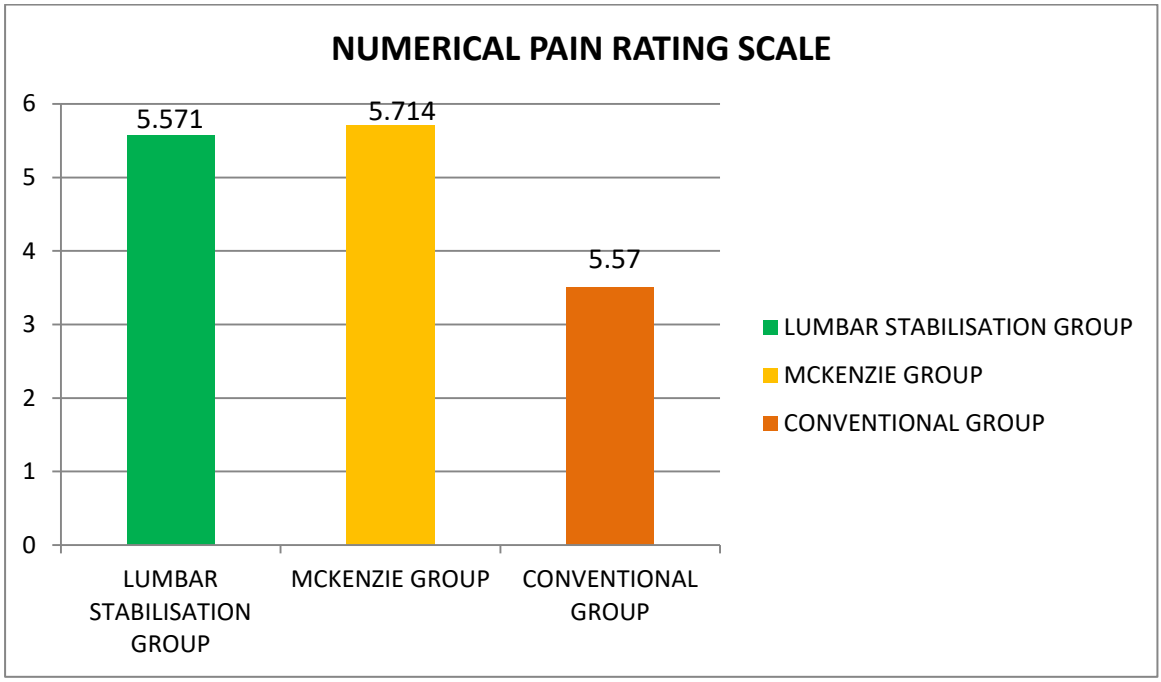
4.2.9 LUMBAR FLEXION RANGE OF MOTION

PAIRED 't' TEST

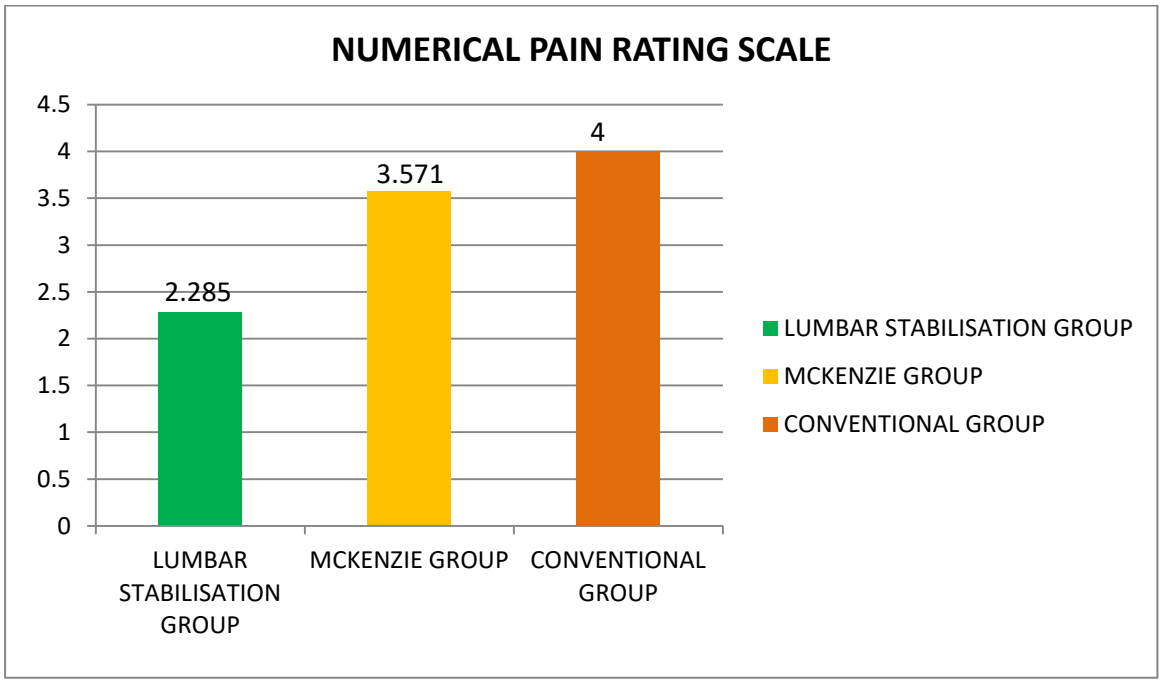


ONE WAY ANOVA

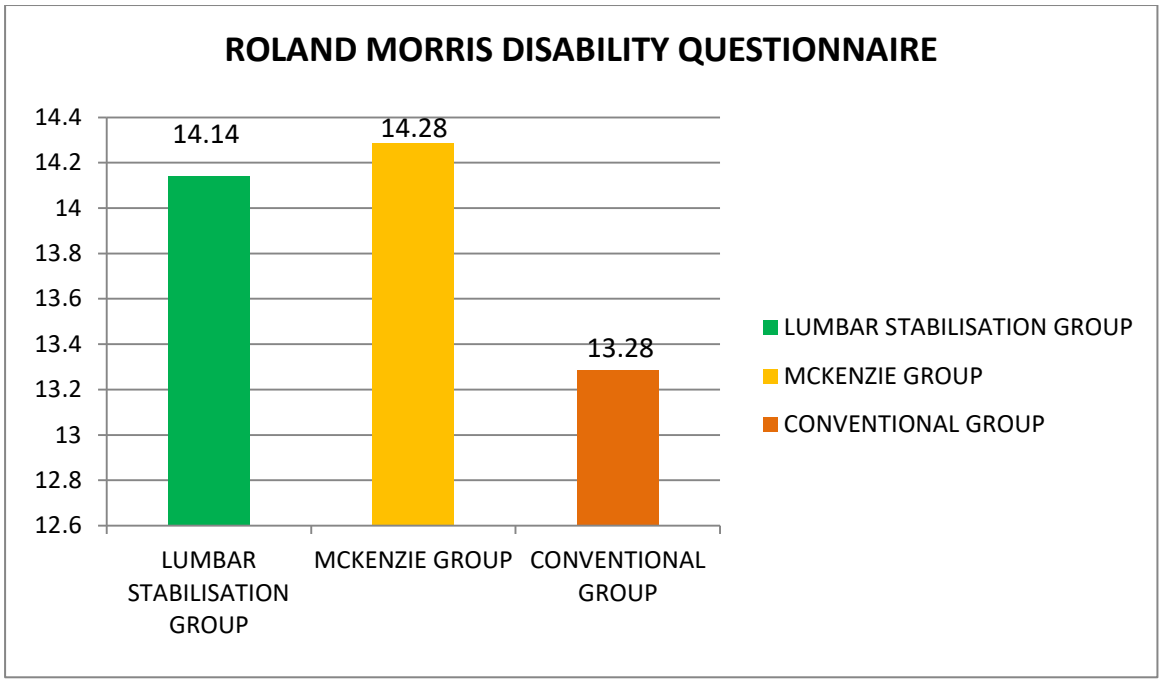
4.2.10 PRE TEST: NUMERICAL PAIN RATING SCALE



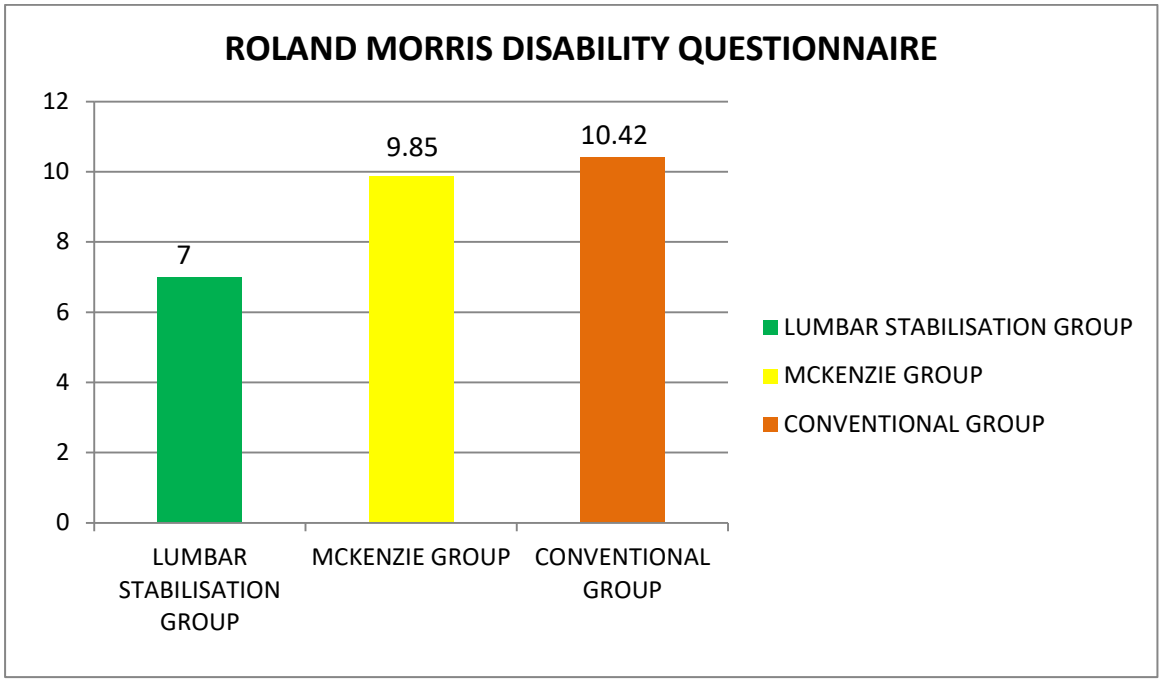
4.2.11 POST TEST: NUMERICAL PAIN RATING SCALE



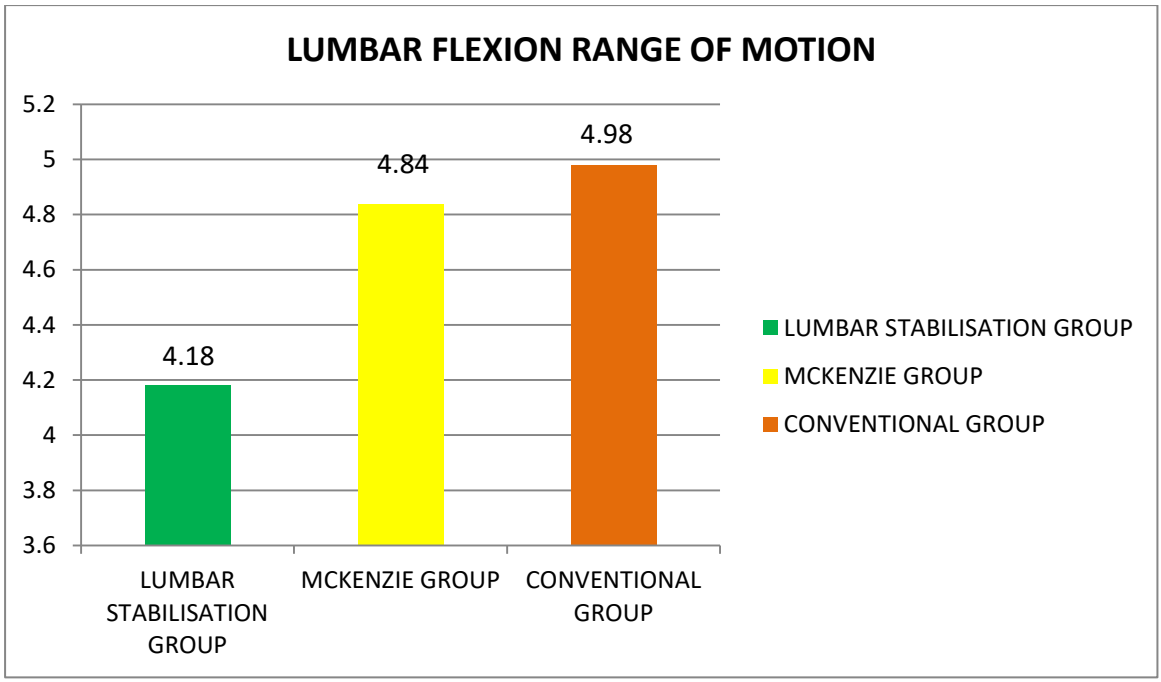
4.2.12 PRE TEST: ROLAND MORRIS DISABILITY QUESTIONNAIRE



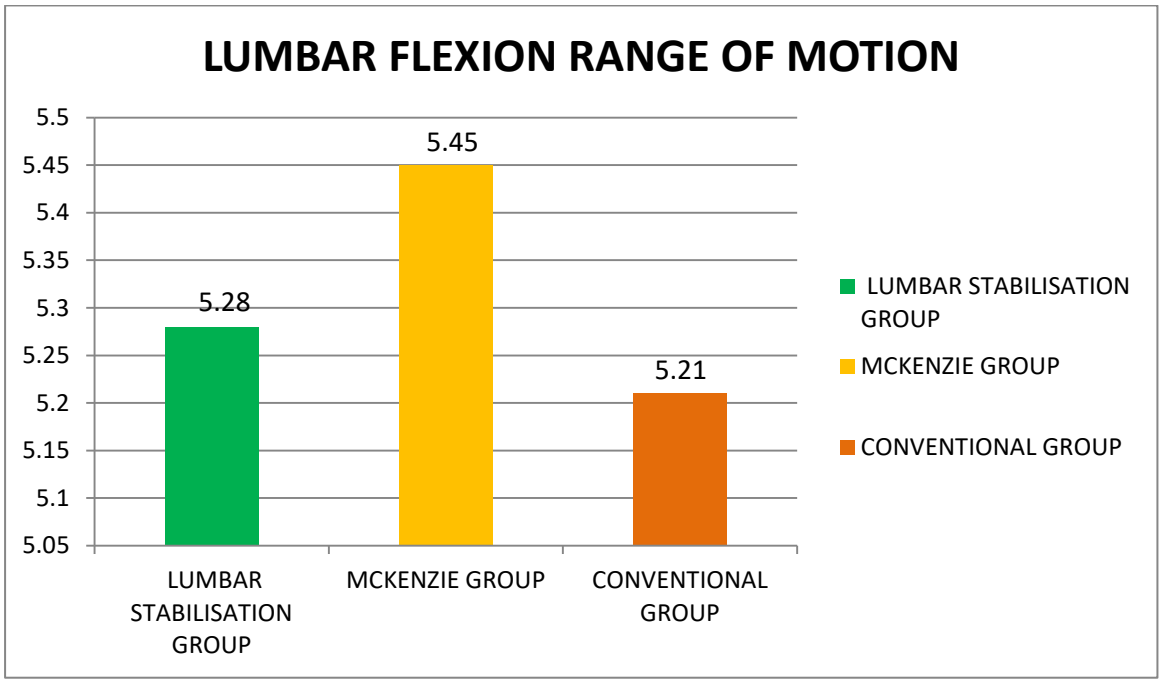
4.2.13: POST TEST-ROLAND MORRIS DISABILITY QUESTIONNAIRE



4.2.14 PRE TEST: LUMBAR FLEXION RANGE OF MOTION



4.2.15 POST TEST: LUMBAR FLEXION RANGE OF MOTION



5. DATA ANALYSIS AND RESULTS

PAIRED ‘t’ TEST

5.1 GROUP A: LUMBAR STABILISATION GROUP

5.1.1 NUMERICAL PAIN RATING SCALE

For 6 degrees of freedom at 5% level of significance, the calculated ‘t’ value was 6.227 and table ‘t’ value wass 2.44 for numerical pain rating scale in lumbar stabilization group . Since calculated ‘t’ value was greater than the table ‘t’ value, the null hypothesis was rejected. Hence there was a significant reduction in the pain of group A.

5.1.2 ROLAND MORRIS FUNCTIONAL DISABILITY QUESTIONNAIRE

For 6 degrees of freedom at 5% level of significance,the calculated ‘t’ value was 8.914 and the table ‘t’ value was 2.44 for roland morris functional disability questionnaire in lumbar stabilization group. Since calculated ‘t’ value was greater than the table ‘t’ value, the null hypothesis was rejected. Hence, there was a significant improvement in the functional ability of group A.

5.1.3 LUMBAR FLEXION RANGE OF MOTION

For 6 degrees of freedom at 5% level of significance, calculated ‘t’ was 9.537 and table ‘t’ value was 2.44 for lumbar flexion range of motion in lumbar stabilization group. . Since calculated ‘t’ value was greater than the table ‘t’ value, the null hypothesis was rejected. Hence, there was a significant increase in lumbar flexion range of motion of group A.

5.2 GROUP B: MCKENZIE GROUP

5.2.1 NUMERICAL PAIN RATING SCALE

For 6 degrees of freedom at 5% level of significance, calculated ‘t’ value was 6.280 and table ‘t’ value was 2.44 for numerical pain rating scale in Mckenzie group . Since calculated ‘t’ value was greater than the table ‘t’ value, the null hypothesis was rejected. Hence there was a significant reduction in the pain of group B.

5.2.2 ROLAND MORRIS FUNCTIONAL DISABILITY QUESTIONNAIRE

For 6 degrees of freedom at 5% level of significance, calculated ‘t’ value was 6.813 and table ‘t’ value was 2.44 for Roland Morris functional disability questionnaire in Mckenzie group . Since calculated ‘t’ value was greater than the table ‘t’ value, the null hypothesis was rejected. Hence, there was a significant improvement in the functional ability of group B.

5.3.3 LUMBAR FLEXION RANGE OF MOTION

For 6 degrees of freedom at 5% level of significance, calculated ‘t’ value was 2.974 and table ‘t’ value was 2.44 for lumbar flexion range of motion in Mckenzie group . Since calculated ‘t’ value was greater than the table ‘t’ value, the null hypothesis was rejected. Hence, there was a significant increase in the lumbar flexion range of motion.

5.3 GROUP C: CONVENTIONAL GROUP

5.3.1 NUMERICAL PAIN RATING SCALE

For 6 degrees of freedom at 5% level of significance, calculated ‘t’ value was 5.279 and table ‘t’ value was 2.44 for numerical pain rating scale in conventional group . Since calculated ‘t’ value was greater than the table ‘t’ value, the null hypothesis was rejected. Hence there is a significant reduction in the pain of group C.

5.3.2 ROLAND MORRIS FUNCTIONAL DISABILITY QUESTIONNAIRE

For 6 degrees of freedom at 5% level of significance, calculated ‘t’ value was 7.068 and table ‘t’ value was 2.44 for Roland Morris functional disability questionnaire in conventional group . Since calculated ‘t’ value was greater than the table ‘t’ value, the null hypothesis was rejected. Hence there was a significant improvement in the function of group C.

5.3.3 LUMBAR FLEXION RANGE OF MOTION

For 6 degrees of freedom at 5% level of significance, calculated ‘t’ value was 2.431 and table ‘t’ value was 2.44 for Roland Morris functional disability questionnaire in conventional group . Since calculated ‘t’ value was lesser than the table ‘t’ value, the null hypothesis was accepted. Hence there was no significant increase in the lumbar flexion range of motion.

ONE WAY ANOVA

5.4 NUMERICAL PAIN RATING SCALE

5.4.1 PRE TEST OF NUMERICAL PAIN RATING SCALE

Pre test for experimental group I, experimental group II and control group were analysed using one way ANOVA test. The calculated value was .0501. For 18 degrees of freedom at 5% level of significance, the table value was 3.55. Since the calculated value was lesser than the table value, there was no significant difference between pretest scores of experimental I, experimental II and control group. Hence null hypothesis was accepted.

5.4.2 POST TEST OF NUMERICAL PAIN RATING SCALE

Post test for experimental group I, experimental group II, and control group were analysed using oneway ANOVA test. The calculated value was 5.851. For 18 degrees of freedom at 5 % level of significance, the table value was 3.55. Since calculated value was greater than table value, there was significant difference between

post test score of experimental I, experimental II, and control group. Hence null hypothesis was rejected.

5.5 ROLAND MORRIS FUNCTIONAL DISABILITY QUESTIONNAIRE

5.5.1 PRE TEST OF ROLAND MORRIS DISABILITY QUESTIONNAIRE

Pre test for experimental group I, experimental group II and control group were analysed using one way ANOVA test. The calculated value was 0.927. For 18 degrees of freedom at 5% level of significance, the table value was 3.55. Since the calculated value was lesser than the table value, there was no significant difference between pretest scores of experimental I, experimental II and control group. Hence null hypothesis was accepted.

5.5.2 POST TEST OF ROLAND MORRIS DISABILITY QUESTIONNAIRE

Post test for experimental group I, experimental group II, and control group were analysed using oneway ANOVA test. The calculated value was 13.909. For 18 degrees of freedom at 5 % level of significance, the table value was 3.55. Since calculated value was greater than table value, there was significant difference between post test score of experimental I, experimental II, and control group. Hence null hypothesis was rejected.

5.6 LUMBAR FLEXION RANGE OF MOTION

5.6.1 PRE TEST OF LUMBAR FLEXION RANGE OF MOTION

Pre test for experimental group I, experimental group II and control group were analysed using one way ANOVA test. The calculated value was 2.78. For 18 degrees of freedom at 5% level of significance, the table value was 3.55. Since the calculated value was lesser than the table value, there was no significant difference

between pretest scores of experimental I, experimental II and control group. Hence null hypothesis was accepted.

5.6.2 POST TEST OF LUMBAR FLEXION RANGE OF MOTION

Post test for experimental group I, experimental group II, and control group were analysed using oneway ANOVA test. The calculated value was 4.01. For 18 degrees of freedom at 5 % level of significance, the table value was 3.55. Since calculated value was greater than table value, there was significant difference between post test score of experimental I, experimental II, and control group. Hence null hypothesis was rejected.

6. DISCUSSION

Back pain is one of the most common medical problems, which seems to occur at least once in 85% of adults less than 50 years of age. Among that, mechanical low back pain is one of the major public health issues. In an attempt to prevent pain, functional disabilities and most importantly to prevent transition towards the chronic stage, various physiotherapeutic approaches have been emerged.

Indeed, it is one of the most common reasons for medical consultation and second most common reason for absenteeism. Due to the high economic impact by the disease on the society, cost efficient treatment approach is of the most essential wanting. Exercise plays an important role in management of low back pain.

This study compared the effects of lumbar stabilization exercises, Mckenzie exercises and conventional exercises on pain, function and range of motion in subjects with mechanical low back pain.

In this study, 21 subjects who met the inclusion criteria were selected and randomly allotted into 3 groups: group A, group B and group C.

Data was collected for pain using numerical pain rating scale , functional ability using Roland Morris functional disability questionnaire and lumbar flexibility using modified Schober's test. The calculated data were analyzed using paired 't' test and one way ANOVA.

The result of the current study found that there was a significant decrease in numerical pain rating scale , Roland Morris disability questionnaire and modified Schober's test in both the experimental groups(lumbar stabilization and Mckenzie group) and the control group(conventional group). But the more percentage of reduction in pain, improvement in the function and increase in the range of motion was found in the lumbar stabilization group and the Mckenzie group than the control group. Among the two experimental groups, it suggests that lumbar stabilization group have a better effect in reducing pain, improving function and increasing lumbar range of motion than the Mckenzie group.

Also there was a significant improvement in the numerical pain rating scale, Roland Morris functional disability questionnaire and the modified Schober's test between the three groups.

Mckenzie developed 3 major classifications of mechanical back pain: postural, dysfunction and derangement syndromes. The definition of dysfunction syndrome includes overstretching of soft tissues that have been shortened or contain contracted scar tissue[34]. For dysfunction syndrome patients, symptom free movement is accomplished until the end range of a shortened structure is realized, at which point there is prohibition of further range accompanied by symptoms[38].

The goal is to remodel shortened tissue by frequently provoking the discomfort of loading at the restricted end range. Dysfunction patients tend to avoid their end range discomforts perpetuating the condition. Mckenzie maintains that once the nuclear material has escaped from the annular wall, the inherent hydrostatic mechanism is no longer intact.

Mckenzie exercise increases endorphins and alter perception of pain perhaps by reducing anxiety and depression. It helps to centralize the pain in core back structures rather than treat pain,that is localized in a specific area.

The overall goal of this Mckenzie exercise program is to reduce pain, develop the muscle support of the trunk and spine and to diminish stress to the intervertebral disc and other static stabilizers of the spine. Thus in the current study, Mckenzie exercises are effective in reducing the pain, improving the function and increasing the range of motion in low back pain patients.

The lumbar stabilization exercise programme concentrates on the local muscle system that would be affected by the low back pain population[35,36]. Many studies had shown the presence of dysfunction in multifidus and in the deep abdominal muscles especially transverse abdominis muscle.It had a delayed reaction in individuals with low back pain. Recent studies have found that all the muscles shows perturbed patterns of activation in case of low back pain.

In case of low back pain patients, they have altered slow motor unit recruitment and this type of exercises would help in normal motor unit recruitment pattern and thus reducing pain and functional ability. The stabilization exercises concentrate on stable pain free positions without any movement. Thus lumbar stabilization exercises are effective in reducing pain, improving the function and increasing the range of motion.

7. SUMMARY AND CONCLUSION

7.1 SUMMARY

To summarise this study, the aim of the study was to compare the effects of lumbar stabilization exercises, Mckenzie exercises and conventional exercises on pain, function and range of motion in patients with mechanical back pain.

21 patients diagnosed with mechanical low back pain who had met the inclusion criteria were randomly allocated into 3 groups who received lumbar stabilization exercises, Mckenzie exercises and conventional exercises

3 outcome measures were taken, numerical pain rating scale to assess the pain, Roland Morris disability questionnaire to assess the functional ability and modified Schober's test to assess the lumbar flexion range of motion.

Results were analysed using paired 't' test and one way ANOVA.

It suggests that lumbar stabilization exercises are more effective in reducing the pain, and improving the function and increasing the lumbar flexion range of motion than the Mckenzie group which is better than the control group. Also, there was a significant increase in the three outcome measures when they were compared between the groups.

7.2 CONCLUSION

Based on the results of the present study, it is concluded that lumbar stabilization exercises are better than the Mckenzie exercises and the conventional exercises in reducing the pain , increasing the range of motion and improving the functional ability.

8. LIMITATIONS AND SUGGESTIONS

8.1 LIMITATIONS

- This study was done with small number of samples. Large sample is recommended.
- This was a short term study and therefore long term study can be done to make the result more valid.
- It was not convenient for all patients to come for post test evaluation exactly after 4 weeks. This was overcome by scheduling their appointment with orthopaedician for review along with the post test assessment.

8.2 SUGGESTIONS

- Only pain, spinal mobility, and functional ability were studied. Further study can be done including other variables like strength and endurance.
- In future studies, the exercises can be done under the supervision of therapist.

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10. APPENDIX –I

10.1 INFORMED CONSENT FORM

I _____, consent the researcher for my voluntary participation in the study "**EFFECTS OF LUMBAR STABILIZATION EXERCISES, MCKENZIE EXERCISES AND CONVENTIONAL EXERCISES ON PAIN, FUNCTION AND RANGE OF MOTION IN PATIENTS WITH MECHANICAL LOW BACK PAIN"**

I have been explained the risks and benefits associated with the interventions to my complete satisfaction. I have understood the procedure and have availed the materials provided by the researcher.

SIGNATURE OF PARTICIPANT :

SIGNATURE OF RESEARCHER :

SIGNATURE OF WITNESS :

APPENDIX-II

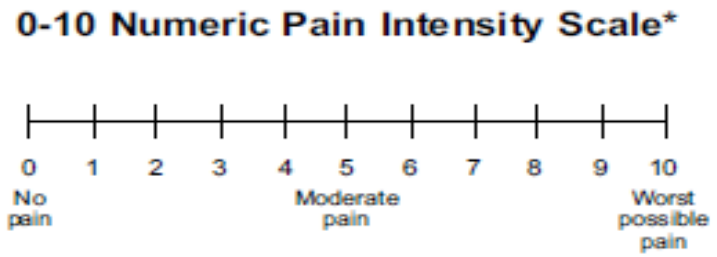
10.2 ASSESSMENT PERFORMA

- NAME:
- AGE:
- GENDER:
- OCCUPATION:
- DATE OF ASSESSMENT:
- REFERRED PERSON:
- ADDRESS:
- CHIEF COMPLAINTS :
- EXAMINATION:
- MEASUREMENT TOOLS

S.NO.	SCALE	PRETEST	POSTTEST
1.	NUMERICAL PAIN RATING SCALE	___	___
2.	ROLAND MORRIS DISABILITY QUESTIONNAIRE	___/24	___/24
3.	MODIFIED SCHOBER'S TEST	___ CM	___ CM

APPENDIX III

10.3 NUMERICAL PAIN RATING SCALE



- The numerical pain rating scale is a segmented numeric version of the visual analogue scale in which a respondent selects a whole number(0-10 integers) that best reflects the intensity of their pain.
- It is an 11 point numerical scale with 0 representing one pain extreme (eg: “no pain”) and 10 representing the other pain extreme (eg: worst pain imaginable).
- The respondent is asked to indicate the numeric value on the segmented scale that describes their pain intensity.
- The number that the respondent indicates on the scale to rate their pain intensity is recorded. Score ranges from 0-10. Higher scores indicates greater pain intensity.

APPENDIX IV

10.4 MODIFIED SCHOBER'S TEST

- The modified schober's test was performed with the participant standing in their own decided neutral erect position, without shoes, and with the feet spaced hip-width apart.
- 2 point were marked at a distance of 15 cms from the lumbosacral junction (Dimple of Venus) 1) 5 cm below the lumbosacral junction and 2)10 cm above the lumbosacral junction.
- And then the participant was asked to bend forward as far as possible and this was considered to be a trial attempt.
- And once again the patient was asked to repeat the movement, the distance between the marks were measured.

APPENDIX-V

10.5 ROLAND-MORRIS LOW BACK PAIN AND DISABILITY QUESTIONNAIRE:

Patient name:

Date:

- I stay at home most of the time because of my back.
- I change position frequently to try to get my back comfortable.
- I walk more slowly than usual because of my back.
- Because of my back, I am not doing any jobs that I usually do around the house.
- Because of my back, I use a handrail to get upstairs.
- Because of my back, I lie down to rest more often.
- Because of my back, I have to hold on to something to get out of an easy chair.
- Because of my back, I try to get other people to do things for me.
- I get dressed more slowly than usual because of my back.
- I only stand up for short periods of time because of my back.
- Because of my back, I try not to bend or kneel down.
- I find it difficult to get out of a chair because of my back.
- My back is painful almost all the time
- I find it difficult to turn over in bed because of my back.
- My appetite is not very good because of my back.
- I have trouble putting on my sock (or stockings) because of the pain in my back.
- I can only walk short distances because of my back pain.
- I sleep less well because of my back.
- Because of my back pain, I get dressed with the help of someone else.
- I sit down for most of the day because of my back.
- I avoid heavy jobs around the house because of my back.
- Because of back pain, I am more irritable and bad tempered with people than usual.
- Because of my back, I go upstairs more slowly than usual.
- I stay in bed most of the time because of my back.

SCORING METHOD:

The Roland- Morris disability questionnaire is scored by adding up the number of items checked by the patient. If patient indicate in anyway that an item is not applicable to them the item is scored ‘no’. then simply, count the scores for a result between 0 and 24.

INTERPRETATION:

Greater levels of disability are reflected by higher numbers. Scores under 4 and over 20 may not show change overtime in patients with scores of less than 4 and deterioration in patients who have scores greater than 20.

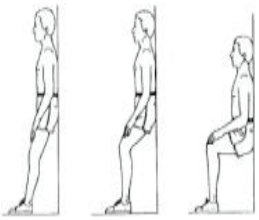
APPENDIX VI

10.6 EXERCISE PAMPHLET

TRUNK STABILISATION EXERCISES

Wall Slides

- Stand upright with your back against a wall and feet shoulder width apart.
- Slowly bent your knees, sliding your back down the wall half the way to the grand and hold this position for 5 sec.
- This straighten your knees by slowly sliding up the wall until you are fully upright with knees straight.
- Repeat the exercise for 10 knees.
- At the end of the second week, repeat the same exercise with only one knee (while you lift the other leg and hold (it)
- Repeat it for 10 knees.

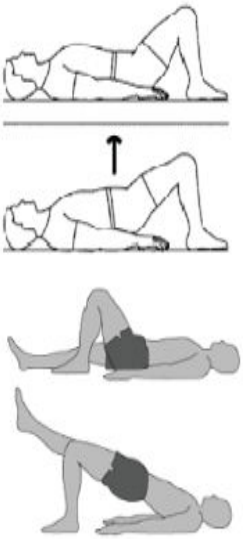


- சுவரில் முதுகை நேராக வைத்து சாய்ந்து, இரு கால்களையும் தோள்பட்டை அகலத்திற்கு அகற்றி நிற்க வேண்டும்

- பிறகு மெதுவாக, முதுகை சுவரில் சாய்த்தவாறே இரு முழங்கால்களையும் தரையில் இருந்து பாதி தூரம் வரை மடக்கவும்
- இதை 5 நொடிகள் பிடித்து பின் முதுகு சுவரில் சாய்ந்தவாறே நிமிரவும் இது போன்று 10 முறை செய்யவும்
- இரண்டு வாரங்களுக்கு பிறகு, இப்பயிற்சியை ஒரு முழங்காலை மடக்கி 10 முறை செய்ய வேண்டும்

Pelvic Bridging

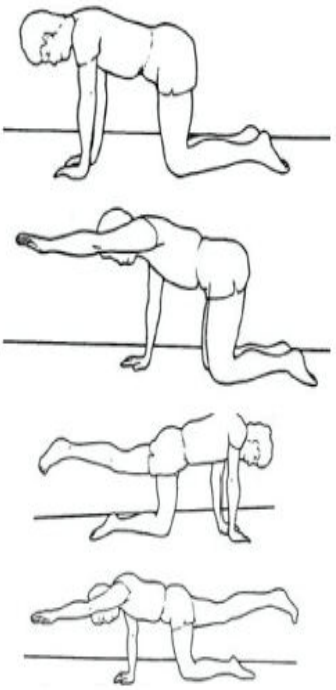
- Lie on your back with the hips and knees bent.
- Lift your buttocks up and away from the couch.
- Hold this position for 10 sec and then relax.
- Repeat it for 10 knees.
- After two weeks, progress , this exercise by lifting your buttocks up and away from the couch and while holding this position, lift one leg.



- மல்லாந்து படுத்துக்கொள்ளவும். பின் இருமுழங்கால்களை மடக்கி பாதம் தரையில் இருக்குமாறு வைக்கவும்
- இரு கைகளையும் பக்கவாட்டில் உடம்பை ஒட்டி வைத்துக் கொள்ளவும்.
- பின் இடுப்பை இயன்ற மட்டும் மேலே தூக்கி 10 நொடிகள் பிடித்து நிறுத்தி பின் தளர்த்தவும். இது போன்று 10 முறை செய்யவும்.
- இரண்டு வாரங்களுக்கு பிறகு, இப்பயிற்சியை ஒரு முழங்காலை மடக்கி 10 முறை செய்ய வேண்டும்

Quadriped

- Get on all four limbs lift one of your hands slowly as much as possible and hold the position for 10 seconds then bring your aims back.
- Repeat the exercise for 10 times
- As the same way lift one of the leg slowly and hold the position for 10 Second them bring the leg back slowly.
- Repeat the exercise for 10 times
- At the end of two weeks, get on your four limbs.
- Simultaneously lift one of your aim and opposite leg and hold it for 5 Sec. and then relase
- Repeat the exercise for 10 times



- மண்டியிட்டு இரு கைகளையும் ஊன்றி நன்கு காலில் நிற்கவும்.
- பின் மெதுவாக ஒரு கையை மட்டும் மேலே முன்புறமாக தூக்கி 10 நொடிகள் பிடித்து பின் கீழே வைக்கவும். இவ்வாறு 10 முறை செய்யவும்.
- பின் ஒரு காலை மட்டும் பின்புறமாக தூக்கி (முழங்கால் மடங்காமல்) 10 நொடிகள் பிடித்து பின் இளைப்பாறவும். இவ்வாறு 10 முறை செய்யவும்.
- இரண்டு வாரங்களுக்கு பிறகு, ஒரே நேரத்தில் எதிரெதிர் கை மற்றும் கால்களை நேராக உயர்த்தி 10 நொடிகள் பிடித்து நிறுத்தி பின் தளர்த்தவும். இது போன்று 10 முறை செய்யவும்.

Abdominal Curl Ups

- Lie on your back with knees bent and fat flat on the floor. lift your head and shoulders off the bed and try to touch your knee with the hands. Hold this for 10 sec and then relax
- Repeat the exercise for 10 times
- After 2 weeks, lie on your back with the feet flat on the floor. Now cross your hands in front of your chest and try to lift you head and shoulders off the bed.
- Hold this for 10 seconds and then relax
- Repeat the exercise for 10 times

- சுநேராக படுத்துக் கொள்ளவும். பின் இரு முழங்கால்களை மடக்கி பாதம் தரையில் இது போன்று 10 முறை செய்யவும்.
- சுபின் தலையையும் தோளையும் தூக்கி, இரு கையால் முழங்கால்களை தொட முயற்சித்தவாறே 10 நொடிகள் பிடிக்கவும் பின் தளர்த்தவும்
- இது போன்று 10 முறை செய்யவும்.

இரு வாரங்களுக்கு பிறகு.....

- நேராக படுத்துக் கொள்ளவும். பின் இரு முழங்கால்களை மடக்கி பாதம் தரையில் இது போன்று 10 முறை செய்யவும்.
- பின் இரு கரங்களையும் படத்தில் உள்ளது போல எதிரெதிர் தோளின் மேல் வைக்கவும்
- பின் தலையையும் தோளையும் மேலே தூக்கிப்பிடித்து 10 நொடிகள் பிடிக்கவும் பின் தளர்த்தவும்.
- இது போன்று 10 முறை செய்யவும்.

MCKENZIE EXERCISES

Lying on The Stomach

- Lying on the stomach with aims close to the body and your head tuned to one side or supported by a small pillow.

- கவிழ்த்து படுத்துக்கொள்ளவும். தலையை ஒரு புறமாக திருப்பிக் கொள்ளலாம்
- இரு கைகளையும் உடம்பில் ஒட்டி நேராக வைக்கவும்.

Extension Prone Lying

- Lie on your stomach and Support your upper body while keeping your forearm flat on the bed
- Lift your head as for as possible and hold it for 10 Sec.
- Repeat the exercise for 15 times

- கவிழ்த்து படுத்துக் கொண்டு, படத்தில் காட்டியவாறு இரு முழங்கைகளையும் படுக்கையை ஊன்றி, தலையை எவ்வளவு உயரம் தூக்க இயலுமோ அவ்வளவு உயர்த்தி, 10 நொடிகள் வரை பிடித்து பின் தாழ்த்தவும்.
- இது போன்று 10 முறை செய்யவும்.

Extension in Prone Lying

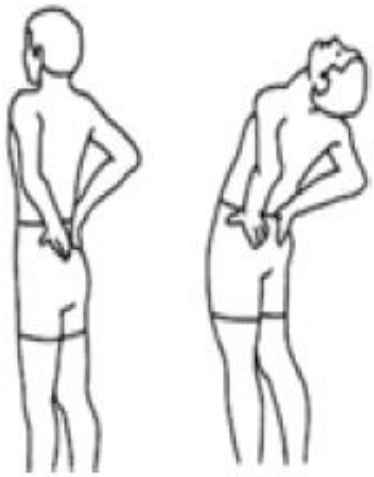
- Push up your upper body with the palms of the hands on the floor just in front of the shoulders and straighten your elbows elevating the upper part of the body, while the hip and thigh remain relaxed.
- Hold the position for 10 seconds and relax.
- Repeat the exercise for 15 times.

- சுகவிழ்த்து படுத்துக் கொண்டு, இரு கைகளையும் ஊன்றிப் பிடித்து முழங்கைகளை நீட்டி உடம்பை இயலும் மட்டும் தூக்கவும்
- சுஆனால், இடுப்பு மற்றும் கால்களை தூக்க வேண்டாம்
- சுஇதை 5 நொடிகள் வரை பிடித்து பின் தாழ்த்தவும் இது போன்று 10 முறை செய்யவும்.

Fit the end of second Week :
இரண்டு வாரங்கள் கழிந்த பின் செய்ய வேண்டிய பயிற்சிகள் :

Extension in Standing Posture

- Stand with feet shoulder width apart, place both the hands at the small of lower back, fingers pointed towards the floor and bring the trunk backwards as far as possible, keeping the neck relaxed.
- Repeat the exercise for 15 times.



- நேராக நின்று கொண்டு இரு கைகளையும் பின் முதுகில் படத்தில் காட்டியவாறு விரல்கள் கீழ் நோக்கியவாறு வைக்கவும்
- முதுகை பின்புறமாக இயலும் மட்டும் வளைக்கவும். தலையை தளர்வாக வைக்கவும்
- இது போன்று 15 முறை செய்யவும

Flexion in Sitting Posture

- Seated on a chair, with knees and hips at 90o, band the trunk forwards until the head is between the knees and the hands close to the floor as possible.
- Try to hold on the ankle, bringing the trunk even closes to the knees. Maintain the position for 5 seconds.
- Repeat the exercise for 10 times.

- நாற்காலியில் அமர்ந்துக் கொண்டு, உடம்பை முன்நோக்கி வளைத்து கீழே குனிந்து கணுக்கால்களை கை கொண்டு பிடிக்க முயற்சிக்கவும்.
(தலை இரண்டு முழங்கால்களுக்கு நடுவில் வரும் வரை)
- இதை 5 நொடிகள் வரை பிடித்து பின் தளர்த்தவும்.
- இது போன்று 10 முறை செய்யவும்.

CONVENTIONAL EXERCISES

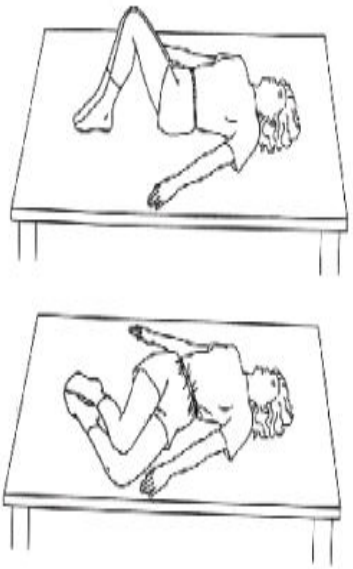
Single Knee to Chest Exercise

- Lie on your back with your knees bent and feet flat on the floor.
- Clasp one of your knee with both hands and pull it towards the chest.
- Hold this position for 5 seconds and then relax. Repeat the same for the other leg.
- Repeat this exercise 10 times.
- After 2 weeks, progress the exercise by holding it for 10 seconds and doing for 15 times.

- மல்லாந்து படுத்துக்கொள்ளவும். பின் இரு முழங்கால்களை மடக்கி பாதம் தரையில் இருக்குமாறு வைக்கவும்
- பின் ஒரு முழங்காலை வருமாறு இழுத்து மார்புவரை வருமாறு இழுத்து பிடித்துக் கொண்டு 5 நொடிகள் பிடித்து நிறுத்தி பின் தளர்த்தவும். இது போன்று இரு கால்களுக்கும் 10 முறை செய்யவும்
- இரண்டு வாரங்களுக்கு பிறகு, இப்பயிற்சியை 10 நொடிகள் பிடித்து நிறுத்தி பின் தளர்த்தவும். இது போன்று 15 முறை செய்யவும்

Lying Trunk Rotation

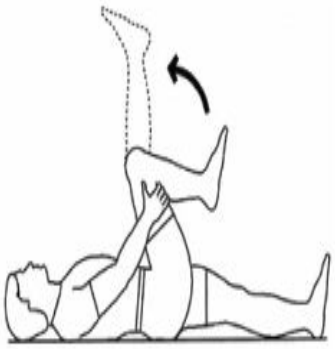
- Lie on your back with hips and knees bent.
- Felts flat on the floor and aims straight beside your body
- Slowly rotate your legs to the one side and then to the opposite side.
- Repeat the exercise for 10 times
- After 2 weeks, progress the exercise by increasing the no. of repetitions by 5 times.



- மல்லாந்து படுத்துக்கொள்ளவும். பின் இரு முழங்கால்களை மடக்கி பாதம் தரையில் இருக்குமாறு வைக்கவும்
- இரு கைகளையும் சிறிது அகற்றி நீட்டி வைக்கவும்
- படத்தில் காட்டியவாறு, பிறகு இருகால்களை மடக்கியவாறே இருபுறமும் மாறி மாறி 10 முறை திரும்பவும். இது போன்று 10 முறை செய்யவும்
- இரண்டு வாரங்களுக்கு பிறகு இப்பயிற்சியை 15 முறை செய்யவும்

Hamstring Stretches

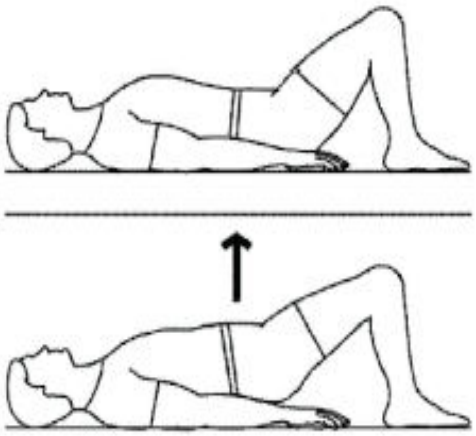
- Lie on your back clasp your hands under the thigh and keep it vertically straight.
- Now by lifting your leg up as far as possible.
- Hold this position for 10 sec and then relax.
- Repeat it is 5 times for each leg.
- After 2 weeks, progress the exercise by doing it 10 times for each leg.



- சுமல்லாந்து படுத்துக்கொள்ளவும். பின் இரு கைகளை கொண்டு ஒரு காலை செங்குத்தாக பிடித்துக் கொள்ளவும்.
- சுஅவ்வாறு பிடித்தவாறே காலை முடிந்த வரை தூக்க முயற்சிக்கவும். இதை 10 நொடிகள் பிடித்து பின் தளர்த்தவும். இது போன்று 5 முறை செய்யவும்.
- சுஇரண்டு வாரங்களுக்கு பிறகு, இப்பயிற்சியை 10 முறை செய்ய வேண்டும்

Pelvic Bridging

- Lie on your back with the hips and knees bent
- Lift your buttocks up and away from the couch.
- Hold this position for 5 sec and then relax. Repeat it for 10 times.
- After two weeks, progress the exercise for 15 times.



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- இரு கைகளையும் பக்கவாட்டில் உடம்பை ஒட்டி வைத்துக் கொள்ளவும்.
- பின் இடுப்பை இயன்ற மட்டும் மேலே தூக்கி 5 நொடிகள் பிடித்து நிறுத்தி பின் தளர்த்தவும். இது போன்று 10 முறை பயிற்சி செய்யவும்.
- இரண்டு வாரங்களுக்கு பிறகு, இப்பயிற்சியை 15 முறை செய்ய வேண்டும்

Prone SLR

- Lie on your stomach lift your leg up from the hip, with the knees straight and hold it for 10 sec and then relax.
- Repeat it for 10 times for both the legs.
- After two weeks, progress the exercise for 15 times.

- மல்லாந்து படுத்துக்கொள்ளவும். பின் இருமுழங்கால்களை மடக்கி பாதம் தரையில் இருக்குமாறு வைக்கவும்
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- பின் இடுப்பை இயன்ற மட்டும் மேலே தூக்கி 5 நொடிகள் பிடித்து நிறுத்தி பின் தளர்த்தவும். இது போன்று 10 முறை பயிற்சி செய்யவும்.
- இரண்டு வாரங்களுக்கு பிறகு, இப்பயிற்சியை 15 முறை செய்ய வேண்டும்

APPENDIX VII

10.7 BACK CARE PROGRAMMES

I Standing

- Correct posture frequently.
- Keep a wide base.
- Change position of feet frequently, shifting the weight from one leg to another.
- Put one foot up on a step or stool for a short period, this changes the position of lumbar spine.
- Stand with the back against the wall and flatten the lumbar spine for few minutes.
- Wear good shoes.

II Sitting

- The chair should have a backrest which provides good lumbar support.
- The back should firmly touch the back of the chair.
- The arm rest should be high enough to support the arms with elbow bent at a right angle, avoiding upward pressure on elbow.
- Hip should be placed right into the back of the seat.

III Lifting

- Test the load: prior to starting to lift, test the weight, if too heavy get assistance.
- Stance: stand with a wide foot base with one foot in front of the other
- Knees: the knees should be bent to half crouch position if the load is not too low and to a full crouched position if the weight is on the floor.
- Back: lifting in slight flexion is necessary .The back should be stabilised and lift perform quickly.
- Object: get the weight close to the body before starting the lift. Keep the arms close to the body.
- Lifting: lift the object by straightening both knees and hip smoothly, weight tucked in close to the body within foot base area.

IV Carrying

- Carry all weights close to the body, even supported by the body.
- Carry with equal distribution of weight. If possible, split all heavy loads into two, one for each hand to give balance.

V Sleeping

- If you sleep on your side, keep knees and lower body bent a little.
- Try to put a pillow under your knees.
- Try not to sleep on your stomach.